



# THE AUTOMOBILE

## THE SPIRIT OF THE YEAR

WHAT have we done?

What have we done as makers of automobiles as seen in the cars exhibited at the Automobile Board of Trade Show in Madison Square Garden and at the exhibition of the National Association of Automobile Manufacturers at the new Grand Central Palace?

What have our engineers done?

Have we made real progress?

These are the questions we ask ourselves as show time comes round and the car becomes the topic of the country. We look about to see where we stand; to see how we measure up with our competitor; to see how we compare with the foreigner who displayed his wares at Olympia. As children we must ever measure our stature. Have we grown? Are we developing the industry into that mature manhood which it is destined sooner or later to attain? Are we so acting and thinking as to bring this about? Are we building permanently? We can only answer these questions by examining the products of our brains, the brains of our engineering forces, the handiwork of our artisans and the business acumen of our managers.

We should have progressed, because 1911 has been a busy year. Our engineers have worked overtime; our pattern shops have operated at high pressure, and our experimental departments have continued their efforts late into the night. It has been a busy year. Many a dry bone has been shaken up and new life instilled; many an old theory has been exploded, and many an old practice discarded. Many a factory has taken an about-face in its line of automobile production; many a manager has had his pride touched as he has been forced to change his designs in order to keep step with the movement of demand; many an engineer has been forced to cast his hobby-horse to the winds and bring out real practical and salable devices; many a so-called sales manager has dropped from his pedestal of car distribution and is heard of no more; many a branch manager has changed his vocation; and going still farther along in the scale, many a salesman has departed—weighed in the balance and found wanting. Nineteen hundred and eleven has been a real year; it has been a testing year; it has been an eliminating year; it has been a year of progress as we would like to define progress.

But what is progress? How is it defined? Progress to the



human mind is comparative, not absolute. We do something in a new way and we say we have progressed. We say this because we like the new way better. It may be it is more commercial; it may meet with public approval more than the old. For efficiency and other reasons we please ourselves by saying we have progressed. Sometimes we go ahead only to retrace our steps; the progress of yesterday becomes the retrogression of today. A few years ago our makers stampeded toward the square motor—they said it was progress; nearly everybody agreed. Today we are going away from the square type to the longer stroke type and still we say we are progressing. What satisfied 2 or 3 years ago does not satisfy today, and there is good ground for designating the change of trend as progress.

#### Spirit of Progress Manifested by Changes

When the great trend was from elliptic rear springs to semi-elliptics we all shouted progress; today we are discarding semi-elliptics and going to three-quarter elliptics and still we shout progress. Examples could be continued, but it is not necessary. Each was a change; each change led to a further change; these led to a third, and the chain is not yet complete. We will continue to change, to alter, to correct, all with the one great object of progressing. Our visions are limited. The engineer dreams of his engine of the future; he transfers his thoughts into drawings which soon become realities. Perhaps they are accepted; perhaps not. If they are it is progress, and if they are not it is progress, because the engineer has learned that there are some things that are not to be bothered with. He has rid himself of many encumbrances. Each accomplishment becomes a step on which he mounts to loftier heights. So we progress.

There have been many changes in the automobile world; many makers have accomplished a great deal; many have taken a step that they have been contemplating for a long time; many have plunged forward because others were going in that direction and they imagined they must be with

the leaders. While there have been a few examples of plunging there have been a great many more examples of cool-headed change. Call it progress; we hope it will prove such. Makers who have been called conservative for the last few years have developed new designs which they have carefully weighed before incorporating them in their cars. Much of the so-called progress of this season has been of the careful-judgment type, and where the makers have changed they have been well satisfied that the change has been a needed one and that it has been a commercial one also.

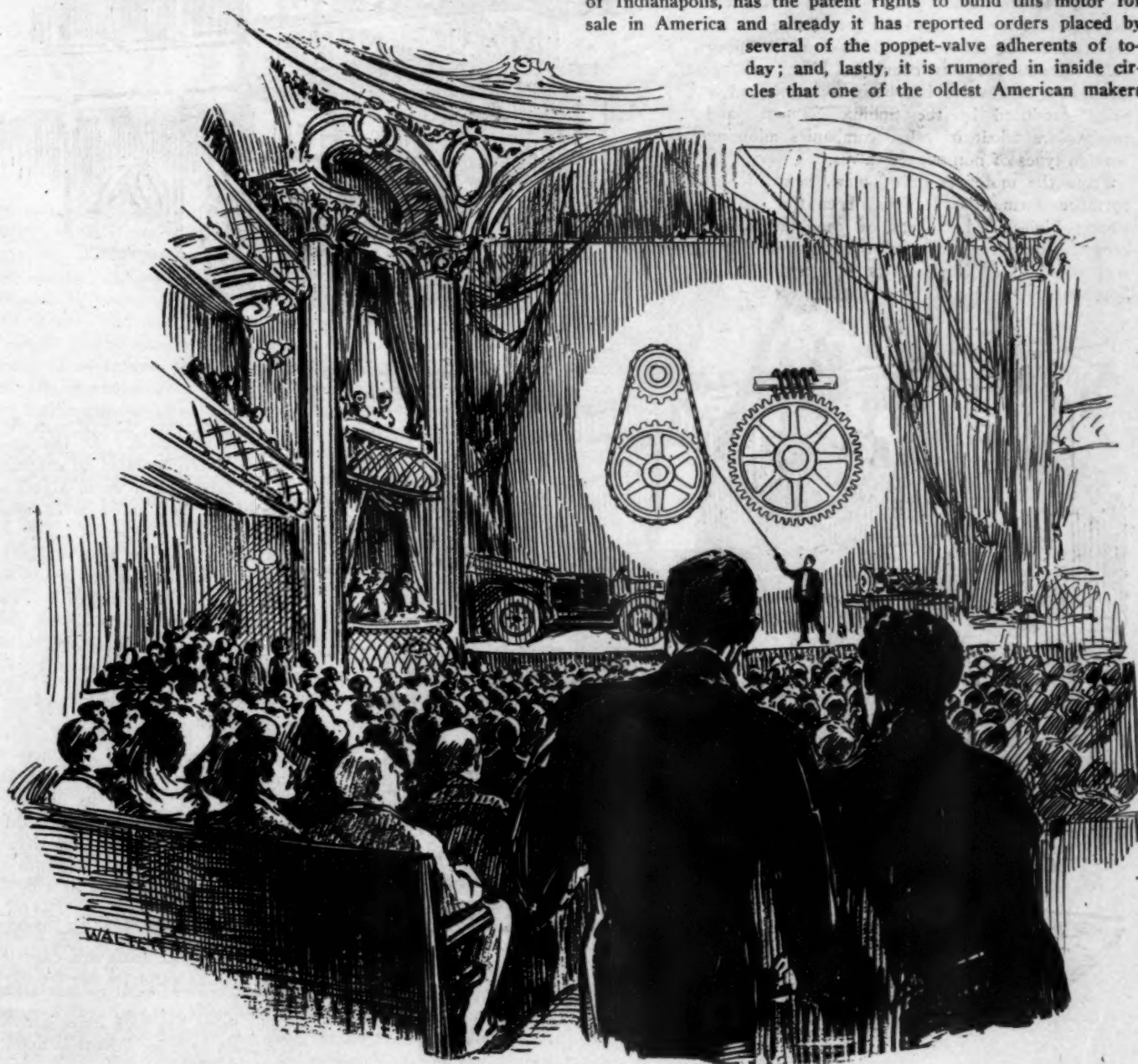
#### Year Shows Few Additions to Makers' List

The year has not been productive of many new names in the car field that have become big factors. Three years ago there was a crop of new companies—companies that were destined to be big corporations in a brief span of years. This has not been the case this year. A few new names have been added to the list of makers, but they have in nearly every case started in on a sane method of production—which would seem to indicate that they expect to continue in business for a long time, if not permanently.

The commercial-car end of the industry has shown vast progress; unprecedented is the best word for the situation. Over a

score of new companies have started; the beginnings have been modest, but the purpose seems deep-founded. Electrics have made good progress; new companies have sprung up and the old ones have increased their outputs. In the electric commercial field the year has been characterized by particular activity in several of the large cities, where the attention of the public has been directed to the possibilities of the commercial electric machine.

In a forecast of what can be seen at the coming shows the progress in the motor field stands uppermost. The Knight double-sleeve motor has arrived in earnest. Four companies have vigorously taken up its manufacture, and a big engine-building company has entered into the manufacture of this type of motor for sale to car-building companies who wish to buy it. Stearns has entirely discarded the poppet-valve type of motor and put all of his trust in the Knight sleeve-valve type; Stoddard-Dayton, while continuing the manufacture of three types of poppet-valve motors, has adopted the Knight type in a new six-cylinder model; in the Columbia factory a Knight type of four-cylinder has been introduced as a running mate to the four-cylinder poppet-valve types; the Atlas company, of Springfield, Mass., has, within the last few weeks, announced that it will market Knight types of motors; the Atlas Engine Company, of Indianapolis, has the patent rights to build this motor for sale in America and already it has reported orders placed by several of the poppet-valve adherents of today; and, lastly, it is rumored in inside circles that one of the oldest American makers



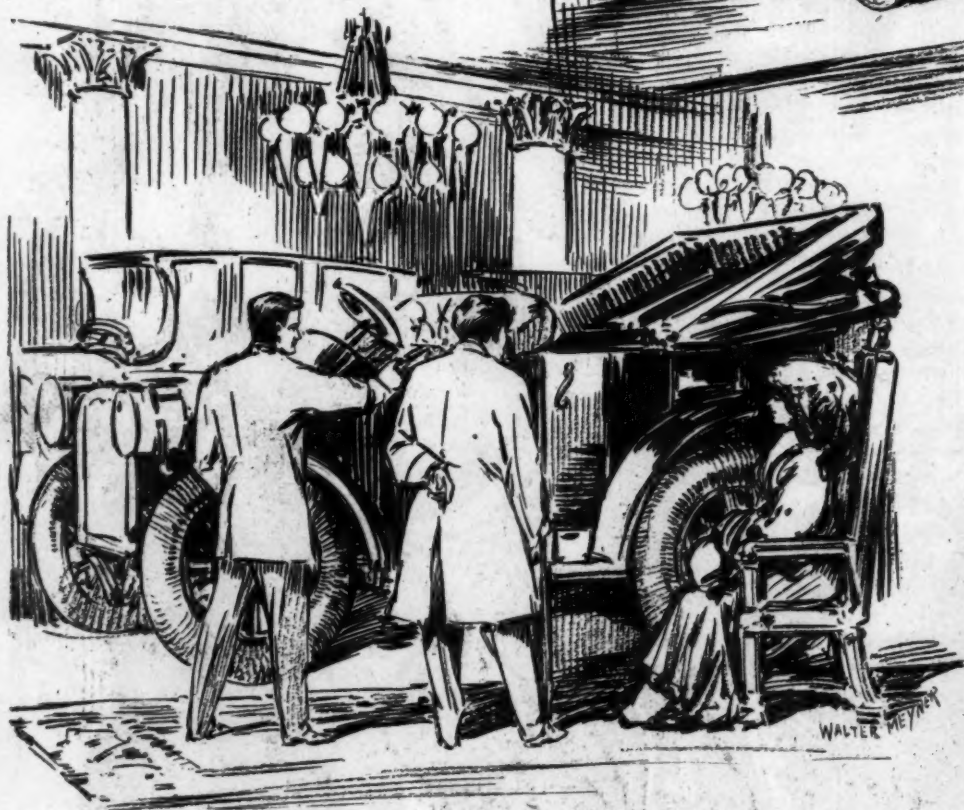
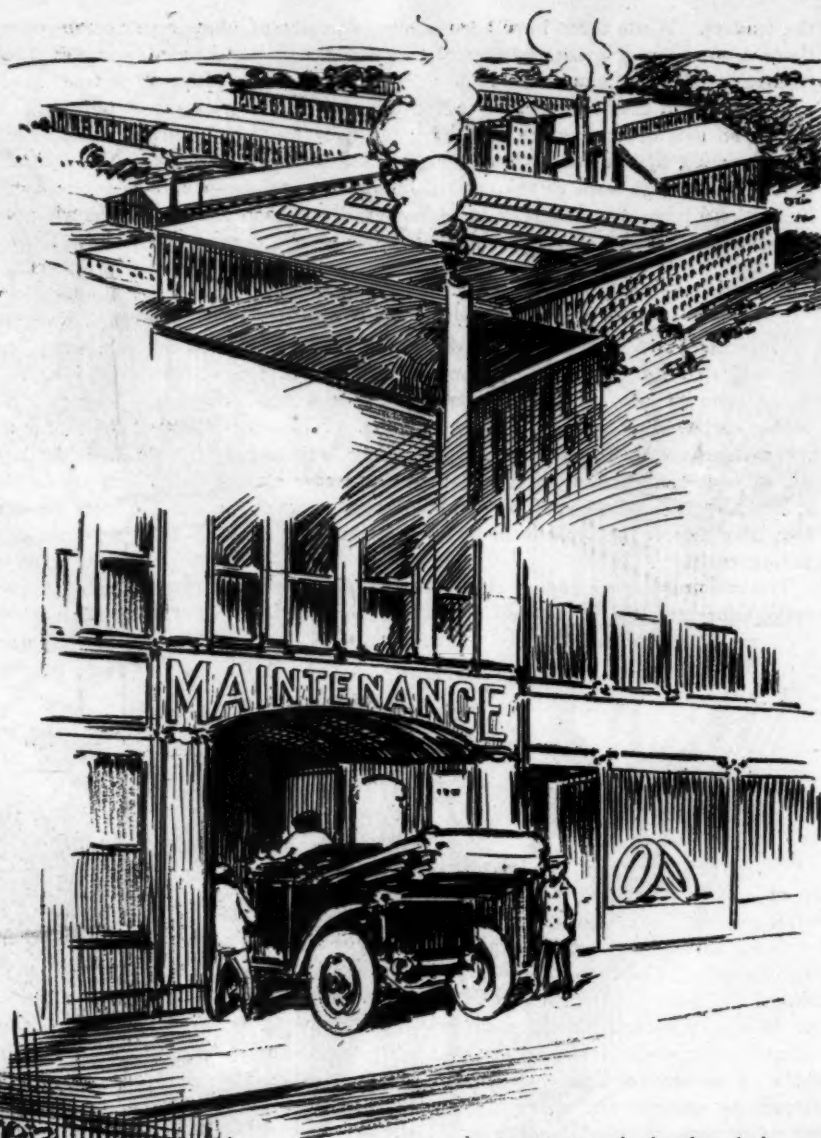
has taken out a license to build its motors under the Knight patent and that a full announcement of this will be made during the present year.

The introduction of the Knight motor, with its two reciprocating sleeves, its quiet operation and its high efficiency, has resulted in a vast amount of research into the non-poppet type of motor. In nearly every city are rumors of sleeve valves, of rotary-sleeve valves, of rotary-disk valves, of reciprocating-piston valves and of rotary-piston valves. Many are in the experimental stages. The Reynolds rotary-disk valve has been under test in several laboratories for over 7 months, and good results have been reported. The Mead rotary valve was introduced to the public last June and has been in operation on several individual cars since then. The Tillotson motor, of Chicago, has been in the development stage for over a year, and many other cases could be cited.

#### Foreign Valve Types Imported

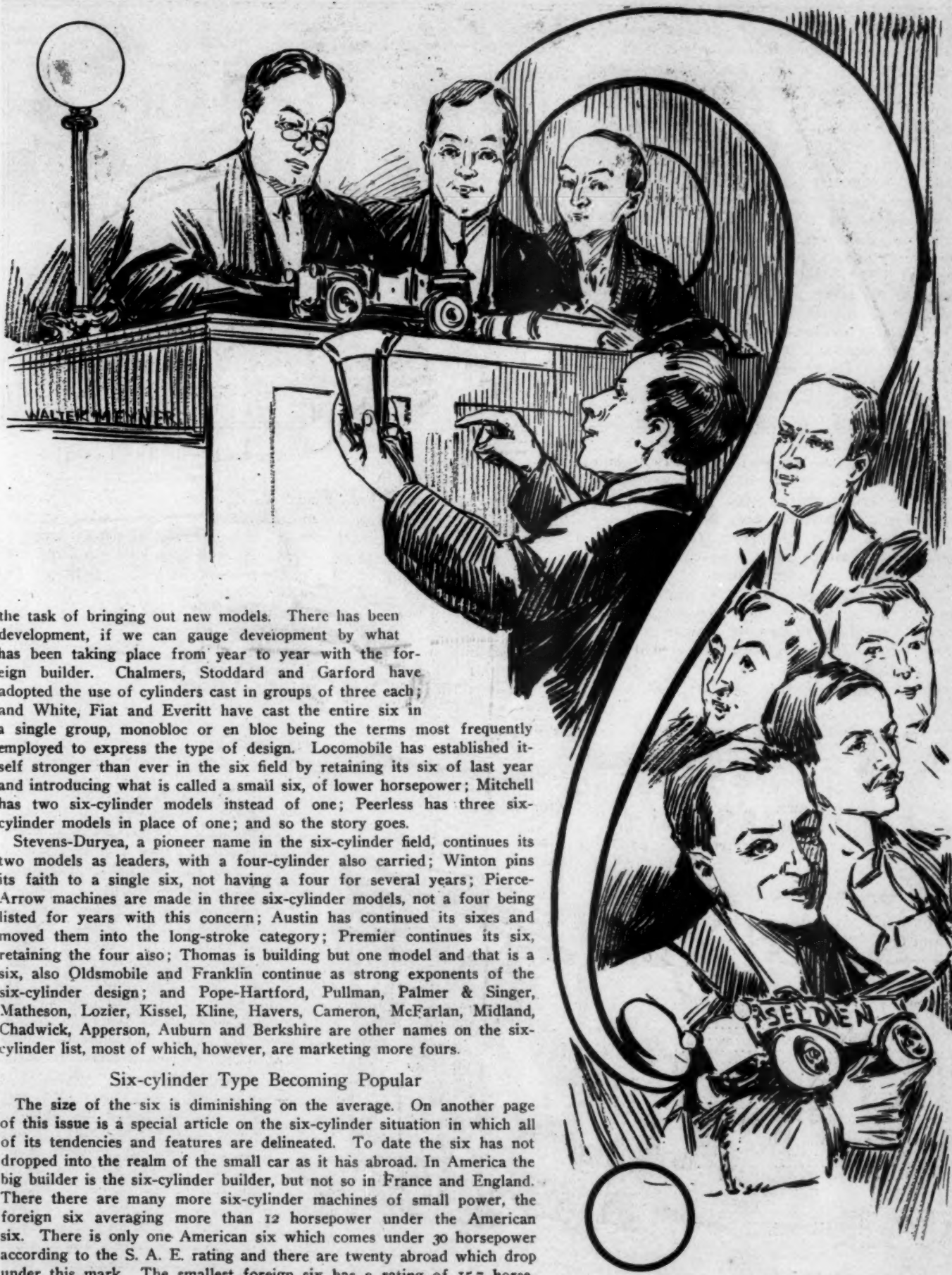
The importation of many foreign types has been a feature of the year and there has been especial activity on the part of American interests securing the control of several European valve patents for this country. The Reno reciprocating-ring valve has been taken up and is being produced by the Sphinx company and rumors are afloat of other companies adopting foreign types of non-poppet valves.

From the motor point of view, next of importance during the year has been the activity among high-priced makers of the six-cylinder group. For a few years many wondered if the six would live. It had its ups and downs. Some of the high-priced-car makers took it up



in earnest and developed it and made it a success. At the same time a dozen builders of medium-priced cars took it up in a sort of sensational but half-hearted manner and soon dropped it. The six has had a more or less vacillating career. For 1912 it has made big progress. It has worked its way deeper into the hearts of the people. The seed that the other makers have been sowing has sprung forth and there is a big harvest. Many new names have been added to the makers of sixes. Packard was one of the first to announce a six-cylinder model for this year and already its output is away up in the hundreds. White has been one of the most recent additions to the list; and during the past fall the names of Chalmers, Stoddard-Dayton, Garford, Fiat and Everitt have been added. Other announcements are expected to be kept as surprises for the show opening.

But there has been more activity in the six-cylinder field than merely

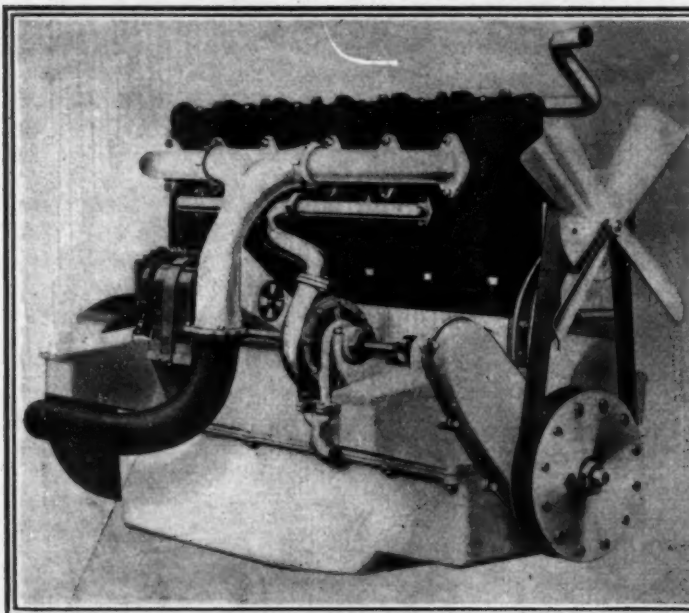


the task of bringing out new models. There has been development, if we can gauge development by what has been taking place from year to year with the foreign builder. Chalmers, Stoddard and Garford have adopted the use of cylinders cast in groups of three each; and White, Fiat and Everitt have cast the entire six in a single group, monobloc or en bloc being the terms most frequently employed to express the type of design. Locomobile has established itself stronger than ever in the six field by retaining its six of last year and introducing what is called a small six, of lower horsepower; Mitchell has two six-cylinder models instead of one; Peerless has three six-cylinder models in place of one; and so the story goes.

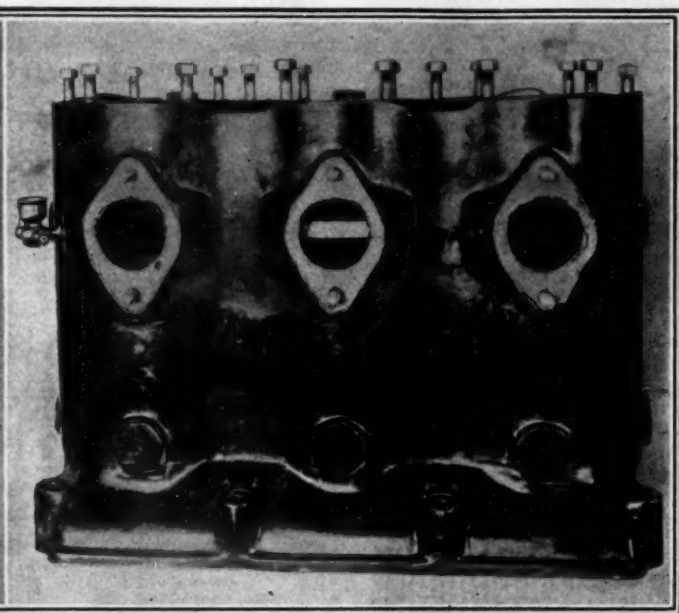
Stevens-Duryea, a pioneer name in the six-cylinder field, continues its two models as leaders, with a four-cylinder also carried; Winton pins its faith to a single six, not having a four for several years; Pierce-Arrow machines are made in three six-cylinder models, not a four being listed for years with this concern; Austin has continued its sixes and moved them into the long-stroke category; Premier continues its six, retaining the four also; Thomas is building but one model and that is a six, also Oldsmobile and Franklin continue as strong exponents of the six-cylinder design; and Pope-Hartford, Pullman, Palmer & Singer, Matheson, Lozier, Kissel, Kline, Havers, Cameron, McFarlan, Midland, Chadwick, Apperson, Auburn and Berkshire are other names on the six-cylinder list, most of which, however, are marketing more fours.

#### Six-cylinder Type Becoming Popular

The size of the six is diminishing on the average. On another page of this issue is a special article on the six-cylinder situation in which all of its tendencies and features are delineated. To date the six has not dropped into the realm of the small car as it has abroad. In America the big builder is the six-cylinder builder, but not so in France and England. There there are many more six-cylinder machines of small power, the foreign six averaging more than 12 horsepower under the American six. There is only one American six which comes under 30 horsepower according to the S. A. E. rating and there are twenty abroad which drop under this mark. The smallest foreign six has a rating of 15.7 horsepower. The foreigner likes the six for its flexibility and in America the great middle class has not yet come under the magic of it.



Exhaust side of the Stoddard-Dayton-Knight six motor.



Cylinder casting of the Stoddard-Dayton-Knight six motor

Next to the six-cylinder trend in motors is the improvement in the four-cylinder type and the trend towards the longer stroke in many of these. The square motor has lost many adherents during the year, by square motor being meant that type with the bore equal to the stroke. There are still many square-type adherents, among them being Cadillac, 4.5 inches; Franklin, 4 inches, in four different models; Jackson, with three models, 4 inches, 4.5 inches and 4.75 inches; Kissel, 4.25 inches; Locomobile, two models, 4.5 inches each; Maxwell, one model, 4 inches and the other 4.25 inches; Oakland, 4 inches; Speedwell, 5 inches; and Buick, with two sixes, 4 and 3.75 inches. There are many examples of companies which have dropped square types and brought out designs with strokes in excess of the bores.

#### Nearly Twoscore New Motors for 1912

There are approximately thirty-eight new motors for this year, by this being meant motors with sizes different from those of last year. Some of these are entirely new types and many others are designs of last year which have had the stroke lengthened and the bore decreased. In all of these there is not a single case of the bore being equal to the stroke; the stroke is invariably the longer. Here are a few examples, which give an idea of the general tendency:

	Bore.	Stroke.
	inches	inches
Pierce-Arrow .....	5	7
Mitchell .....	3.75	5.5
Chalmers .....	4.25	5.25
Everitt .....	4	4.75
Inter-State .....	5	6
Locomobile .....	4.25	5
Abbott-Detroit .....	4.5	5.5
Stearns .....	4.25	5.5
Knox .....	5	5.5
Maxwell .....	4.25	5.25
Regal .....	4.25	5.5
Oakland .....	4.5	5.25
Mercer .....	4.5	5
Austin .....	4.5	7
Cole .....	4.5	5.25
Garford .....	4.125	5.25
Haynes .....	4.5	5.5
Halladay .....	3.75	5.25
Kline .....	4.25	5.5
Lexington .....	4.125	5.5
Lambert .....	4.125	5.5
Peerless .....	5	7
Peerless .....	4.5	6
Peerless .....	4	4.5
Oldsmobile .....	4	6
Columbia .....	4.875	5.5

Many more examples could be given, but these are sufficient to prove that the longer stroke idea has taken possession of the makers. These figures also prove that the abnormally long-

stroke motor has not made its appearance here as it did abroad a few years ago. In America it is rare to find a motor in which the stroke is more than one-half in excess of the bore, but in Europe such designs are common. The long-stroke motor means a high motor. In Europe the roads are such that small clearance is needed and so the motor can be carried low without danger of the flywheel striking on the ground, but in America the condition of the roads demands ample clearance. The American designer has shown his good judgment in not imitating blindly the foreign practice. What changes another year will bring forth in this longer stroke trend time alone can tell.

Close behind the long-stroke-motor trend comes that of the use of self-starters. Nineteen hundred and twelve will go down in automobile history as a self-starter year. The automatic starter, as many prefer to designate it, has come as an avalanche. It has been as a flash of lightning from a clear sky. Only a few fitted them until suddenly a popular-priced car announced the inclusion of self-starters as stock equipment. That set the pace. Other makers delayed their 1912 announcements until they could include a self-starter in their equipment. The medium-priced makers have taken it up with more avidity than the high-priced makers, but the result is the same. The public has waited long for this device and it is to be hoped that self-starters will be improved and within a twelve-month made a corporate part of every motor.

But motors have been improved in many other ways. Quietness has been a big aim. The introduction of the non-poppet type has made this imperative. Designers have worked long and hard to get rid of the noise. Cams have been redesigned; valve springs have been inclosed; fiber washers have been embedded in the tops of the valve tappets; springs have been inserted to retain the tappet rollers in contact with the cams; some makers have introduced arc-shaped levers between the cams and tappet rollers; and others have worked on valve shape and size with the hope of reducing noise. All have had their results. Besides reducing noise many have increased efficiency and the net result has been progress.

There has not been the widespread alteration in lubrication that characterized the cars of a year ago. The circulation system of oiling led by a big margin a year ago and it has gained followers since then. Perhaps the real trend in motor lubrication today is the adoption of the non-splash system by many. In this the oil is fed under pressure to the crankshaft and connecting-rod bearings and there is not any splash level in the base of the crankcase into which the connecting rods dip. With this non-

splash system there is not that churning up of the oil so common in many splash designs. A novelty in motor lubrication is the trough system in use on the Knight type of sleeve-valve motors. Beneath each connecting-rod is a small hinged trough into which the oil is fed. A small scoop on the lower end of the connecting-rod dips into this oil and the lubricant is led through the scoop up into the connecting-rod bearing. A little is splashed into the sleeves. The troughs are interconnected with the throttle so that with a wide-open throttle more oil is fed, this being an excellent feature of the system. This interconnection of throttle and motor lubricant was one of the features of the Olympia show a few months ago, many of the leading French and German makers in both poppet and non-poppet valve types employing some form of interconnection.

The honors of progress in carburetion for the year are divided. Part belong to the carbureter makers who build carbureters for all of the different car builders; and credit must also be given to the makers of cars who manufacture their own carbureters. It is difficult to follow any definite line of progress with carbureter builders. They are operating along many different lines and yet all are obtaining satisfactory results. One maker, who has used for many years an auxiliary air valve has discontinued this in his latest models and brought out an absolute mechanical device in which both air and gasoline are under manual control; another has added features in the way of the auxiliary air valve. There is much unrest in the matter of using the single-jet type or the multi-jet type. Much experimenting has been done with the multi-jet with good results, and it will, undoubtedly, be more in the public eye during the coming year than it has ever been before. One carbureter feature that has come to the front is that of bypassing gasoline past the nozzle to facilitate starting, the *modus operandi* being that by holding the throttle closed, the pull of the engine is exerted on the gasoline in the bypass channel and a good supply is drawn in to give the desired rich mixture for starting.

In carburetion the old problem of controlling the gasoline remains in a more or less unsettled condition. The method of lifting the needle valve in the nozzle with each opening of the carbureter is continued; and in addition one builder is making use of the motor pull on air column to control gasoline feed.

The ignition department has progressed. The two-spark magneto is now being fitted as stock in many factories. In this instrument there is a double secondary winding, and a double distributor and two sets of spark plugs in the cylinders. Two sparks are delivered in synchronism. In a T-head motor this gives a very perceptible increase in power as has been demonstrated on the dynamometer. A still more important factor in ignition is the adoption of the automatic-spark governor which has been incorporated in the magneto. Such governors were shown in one or two cases last year, but for this season they have gained

in popularity. By the governor the ignition expert insures a maximum of efficiency.

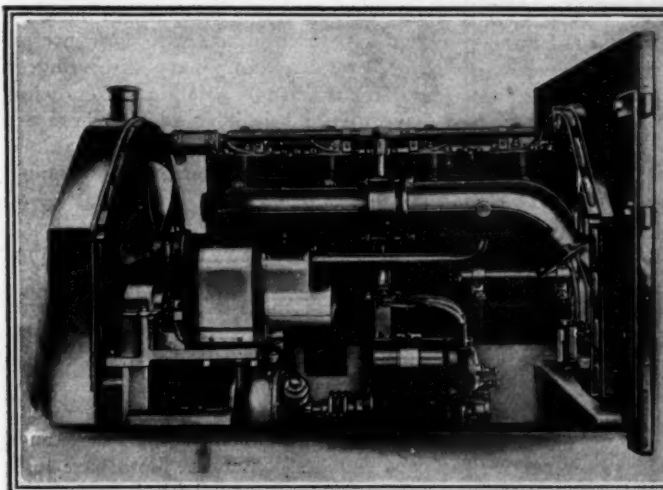
While the monobloc construction has showed little more than a start in six-cylinder motors, there is no denying the position that it now holds in the four-cylinder field. There are at present over fifty-one different models of four and six-cylinder design in which the cylinders are all formed in a single block. This list includes all of the names of those using this type of construction last year as well as many additions. It is a characteristic fact that concerns that have once adopted this construction have not departed from it. It is also conspicuous that such firms as White and Metzger, that have used monobloc construction during years past in four-cylinder motors, have continued its use in their new six-cylinder designs.

#### Monobloc Construction Generally Applicable

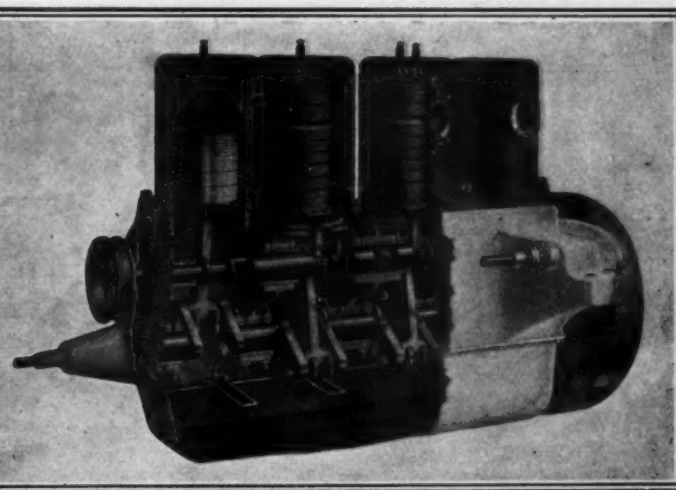
Among the old makers of block castings are: White, Ford, Hudson, Chalmers, Bergdoll, Courier, Lambert, etc. Other companies using this type of casting are: American, in two new models; Colby; Stoddard-Dayton, in its Savoy and Stratford models; Staver, in two motor sizes; S. G. V., in two sizes; Schacht, in two sizes; Warren-Detroit, in three sizes; Everitt, in three models with the same cylinder sizes; and the following in one-cylinder size: Cutting, Davis, Firestone-Columbus, Flanders, Garford, Great Southern, Halladay, Henry, Herreshoff, Carhart, Clark, Crawford, Krit, Metz, Only, Paige-Detroit, Pathfinder, Pilot, R. C. H., Reading, Regal, Roder, Richmond, etc.

While it is safe to state that all of these motors are of the medium-size division still it would be wrong to convey the idea that the block type of design cannot be used and is not being used in motors of considerable size. The bore and stroke of the Reading are 5 and 6 inches respectively; the Schacht has one model with 5.25-inch bore and 4.5-inch stroke. These are the largest sizes; in fact, these are the only sizes in which the bore reaches the 5-inch mark. For reference purposes a list is attached herewith giving the cylinder dimensions and the horsepower of most of the monobloc types.

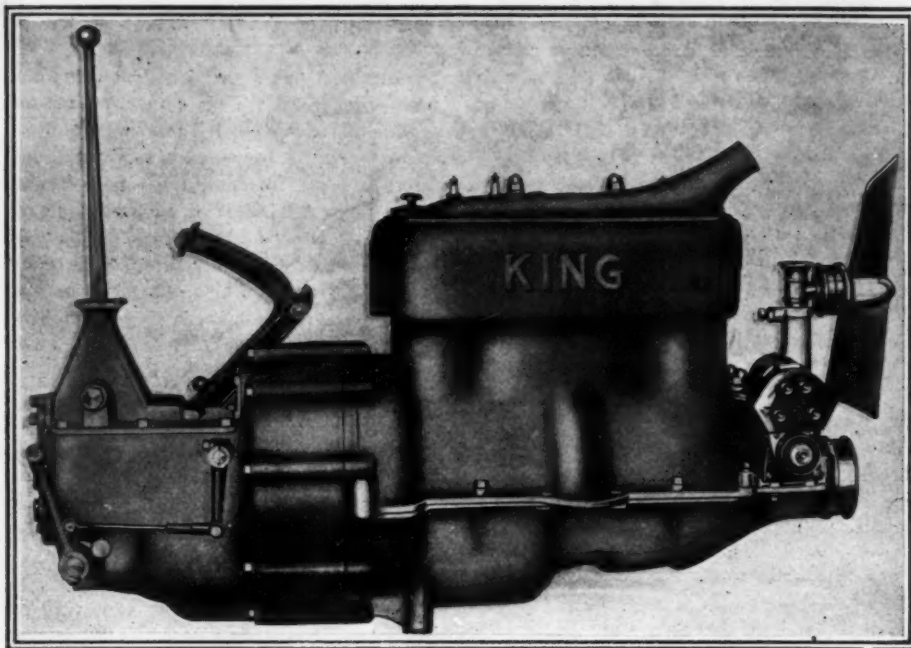
Name.	Model.	Bore.	Stroke.	H.P. (S.A.E.)
American	20	3 3/4	4 3/8	22.5
American	30	4 1/2	5	32.4
Bergdoll	C	4	4 3/8	25.6
Bergdoll	D	4	5 15/16	25.6
Carhart	J	4 1/16	4 3/8	26.4
Chalmers	30	4 1/2	4 3/8	25.6
Chalmers	36	4 3/4	5 1/4	28.9
Clark	T	4 1/16	4 3/8	26.4
Colby	L	4 1/16	4 3/8	26.4
Courier	1912	3 3/4	5 1/8	22.5
Crawford	12-30	4 1/2	4 3/8	32.4
Crow-Elkhart	50	3 3/4	4 3/8	22.5
Crow-Elkhart	52	4	4 3/8	25.6
Cutting	A-30	4	5	25.6
Davis	40	4 3/8	5 1/4	27.3
Everitt	30, 4-36	4	4 3/4	25.6
Flanders	S	3 3/4	3 3/4	20.3



Magneto side of the Stearns-Knight motor

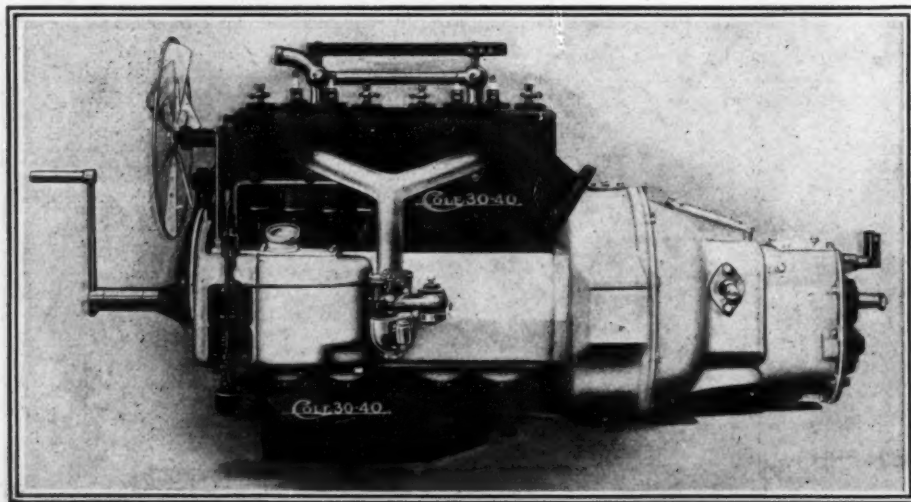


Sectional view of the Columbia-Knight motor



Showing the block casting and the unit construction of the King motor

Name.	Model.	Bore.	Stroke.	H.P. (S.A.E.)
Flanders .....	T	3 3/4	4	22.5
Garford .....	G-12	4 1/4	5 1/4	28.9
Great Southern .....	30	4	4 1/2	25.6
Halladay .....	30	3 3/4	5 1/4	22.5
Henry .....	W	4	4 1/2	25.6
Henry .....	C	4 1/4	5 1/4	27.3
Herreshoff .....	25	3 3/4	3 3/4	18.3
Hudson .....	..	4	4 1/2	25.6
Kenmore .....	D	3 3/4	3 3/4	18.3
King .....	36	3 13/16	5 1/4	23.2
Krit .....	A, K	3 3/4	4	22.5
Lambert .....	{ 66-B 66-C	4 1/4	5 1/4	27.3
Metz .....	22	3 3/4	4	22.5
Only .....	..	4 1/4	7 7/8	28.9
Paige .....	Beverly	3 3/4	4	22.5
Pathfinder .....	40	4 1/4	5 1/4	27.3
Penn .....	R-F, T4	3 3/4	4 1/2	22.5
Penn .....	T-R, T-5	4 1/4	5 1/2	27.3
Pilot .....	40	4 1/4	5	32.4
R. C. H. .....	..	3 3/4	5	16.9
Reading .....	40	5	6	40.0
Regal .....	N	3 3/4	4 1/2	22.5
Roader .....	20	3 3/4	4 1/4	15.6
Richmond .....	M	4 1/2	5	32.4
Schacht .....	E	5 1/4	4 1/2	21
Schacht .....	GF	4 5/16	5	29.2
S. G. V. .....	A	3 3/4	4 3/4	22.5
S. G. V. .....	D	4	5 1/4	25.6
Staver .....	35-B	4 3/4	5	30.6
Staver .....	35F, 40F, 40RR	4 1/2	5	32.4
Stoddard-Dayton .....	Savoy	4	4 1/2	25.6
Stoddard-Dayton .....	Stratford	4 1/2	5 1/4	32.4
Warren .....	12-30	4	4 1/2	25.6
Warren .....	12-40	4 1/4	4 3/4	28.9



Illustrating the valve action housing and the unit construction of the Cole motor

In connection with block motor casting it is not as yet a settled fact as to whether it is best to incorporate the intake and exhaust manifolds as well as the intake and outlet water pipes with the cylinder castings. Some makers who started a season or two ago to do this have more recently adopted the separate intake and exhaust manifold with integral water pipes, whereas others have pursued an opposite course. It is not a big factor in design and often the conveniences of the maker are the turning points in the selection of the design to be used. The incorporating of the intake manifold with the waterjacket is a design well worth copying, as it insures a warm intake passage and the consequent prevention of condensation of the intake gases.

The use of thermo-syphon cooling has not progressed as was anticipated, and it is not making the headway in America that it is on the other side of the Atlantic. There is not a case of its discontinuance by an American maker who has been using this system of water

circulation; and on the other hand there are not many cases of its being introduced. By careful estimate but 23 per cent. of the different chassis models listed for this year use this system, 72 per cent. continuing with the pump. The air-cooled following constitutes 5 per cent. of the total number of listed chassis. The generally-advanced reason for continuing with pump circulation is that it gives entire satisfaction and that to change to thermo-syphon would mean a redesigning of the cylinders to give added water space, a new design of radiator and vastly increased water pipes, all of which would be a big expense to the maker at the start, although the construction would be cheaper later on.

#### Review of Chassis Construction

In a cursory review of the chassis parts in general not so much activity is noted. It is true there have been refinements all along the line, but they have been more a matter of detail. Brakes have been increased in diameter and often width has been added to the drum. There has been a more general adoption of equalizers in medium-priced automobiles and the equalizers with all of the other brake connections are now carried inside of the side frame members, thereby giving a much cleaner chassis appearance. The use of fabric for friction surfaces continues; in fact, it has gained during the year. Some makers who have used bronze with cork inserts for several seasons have discontinued this for the use of a fabric; others who have used fabric have adopted bronze; and when the entire field is surveyed it is difficult to trace any very definite trend in this respect. There has been perceptible improvement in the adjustment features. Many have placed the adjustments under the front floorboards; and those who have left them at the rear have brought them into a more accessible position, so that the driver has not to convert his arm into an L in order to tighten up either set.

The war between multiple-disk and cone clutches continues. Both have lost some adherents and both have gained some during the year. They are now

on a par so far as following is concerned. The expanding band type of clutch has lost considerably and the contracting band has a following of but 1 per cent. at the present time.

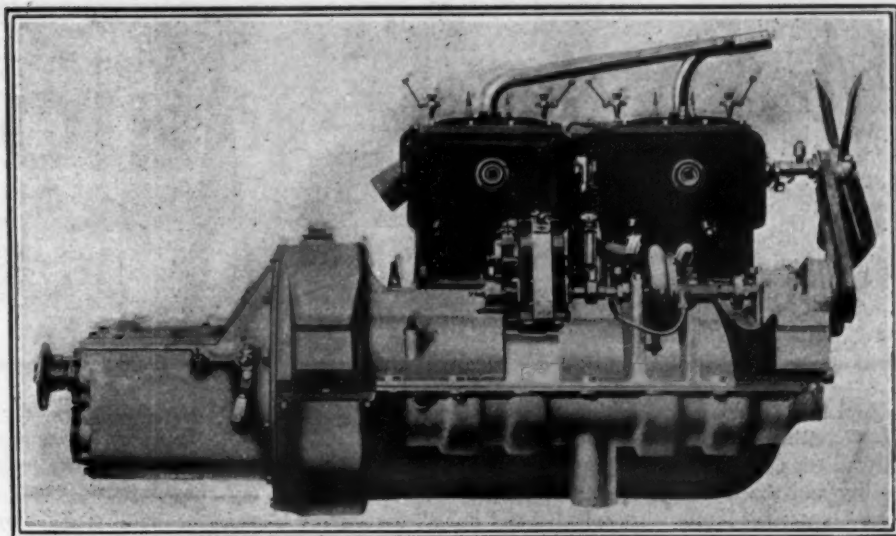
In the gearset field the selective set has entirely outdistanced all others and has been gaining steadily, although the landslide during the past 12 months has not been so conspicuous as it was 2 years ago. There have not been so many to landslide. The four-speed set has not gained so generally as there were reasons to expect. Sixty-one different chassis on the 1912 market are fitted with four-speed sets, but this is relatively small when compared with 276 chassis in which the three-speed set is made use of. But 3 per cent. of the chassis made use of the progressive gearset and only 2 per cent. use the planetary set.

Shaft drive controls the entire field, its following being 93 per cent. Half of the chassis types mount the gearset as a separate unit in the center of the chassis and the other half form it as a unit either with the motor or with the rear axle. These two types of unit construction are to all purposes on an equal footing, the unit type with the motor being a leader by a very slight margin.

#### Drop Frame and Control Changes Considered

When the framework and springs and axles are looked into the coming of the double-drop frame cannot be overlooked. Its progress is slow, but it is certain. There is much difference in how the two drops are positioned. One maker will locate them immediately in front of the back axle so that the only advantage attained is the lowering of the door to the tonneau portion. Another maker will have the forward drop at the dash so that he accomplishes a lowering of many of the chassis parts and a consequent lowering of the center of gravity of the car. The tendency still seems to be along the line of a very stiff frame construction, with heavy flanges on the side members, these flanges being specially wide in the central chassis parts. With this framework creaking noises between the body sills and the frame often develop. Not a few foreign chassis shown at the recent Olympia use what is called the flexible frame construction, with the express object of getting away from what are termed body creaks. This is more essential abroad, due to the present craze for quietness, but it is sure to receive more or less attention in this country within the coming year.

In the body field there have been many noted trends. The fore-door type has become absolute. Those concerns who fought against it last year and who decided to bring out 1912 types without the fore-door were compelled to delay the announcement of this year's models until fore-door bodies were arranged for. Many makers put the question up to their dealers in all of the different states. From every quarter came the same demand for the fore-door, and often the engineer and factory heads were forced to bow to the will of the people. The use of the fore-door has called for the placing of the brake and change speed levers inside the body. Some makers have tried to do this without widening the body, and they have generally failed. There are cars on the market where it is impossible to operate the emergency brake



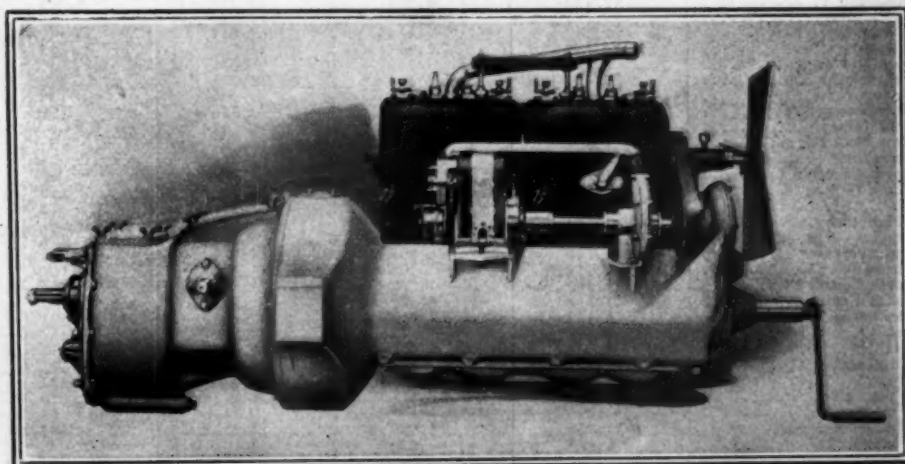
Magneto and water pump mounting on the Abbott-Detroit unit power plant

lever without scraping the back of the hand against the inside of the body. This is not conducive to continued popularity. There are others in which the change speed lever is too close to the knee of the driver. One maker has put the change speed lever at the middle and left the emergency lever outside, giving knee room and preventing mixing of the levers.

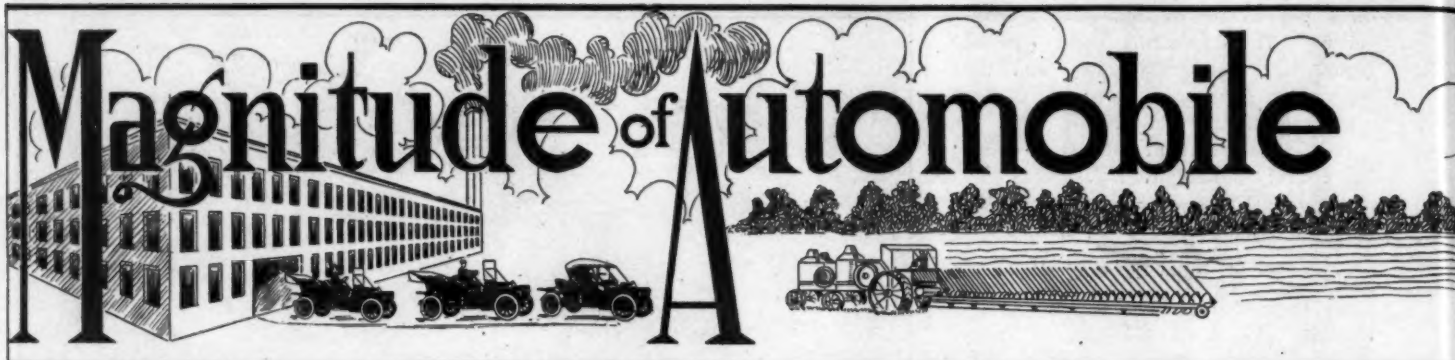
There has been much change in the matter of control. Placing the steering column on the left side has gained very materially. This is now being done on many high-priced machines. The new Stoddard-Dayton six with the Knight motor has left-hand control; so has the new White six and also the new National models. Many other cases could be cited. In nearly every case where the steering pillar is mounted on the left side the change speed and emergency brake levers are placed in the middle of the floor-board. This is generally an excellent mechanical job; it is cheaper to manufacture than the side position and there is not any interference with the bodies. The only inconvenience some have suggested as arising from the central lever position is that it interferes with the lap robe. This is not material, because the individual lap robe for each front-seat passenger is more desirable than one large robe for both.

In the matter of closed bodies there has been a strong trend in the limousine direction. Many of the touring cars selling at the \$2,000 mark or under have been fitted with limousine bodies and the price placed around \$3,000. The older concerns which have been building enclosed types of cars for several seasons have more generally adopted the use of the Berline type—that

(Continued on page 73.)



The Oakland crankcase, clutch and gearset are enclosed in a unit aluminum housing



ALMOST every one is interested in the automobile industry, either directly or indirectly, and statistics relating to it engage the attention the more because of their ephemeral quality and the difficulty of securing them. No one can fail to have respect for an industry which has climbed, literally by leaps and bounds, to fifth place in the list of our country's mammoth businesses in the course of a decade. Even as this article goes to press the figures which are given in the tables and charts are gradually but continually changing. But these changes are going on in the new year, 1912, and the figures given hold good for the old year, 1911; so let us see what they are.

The question most often asked of those whose fingers are nearest the pulse of the automobile industry is, How many automobiles are there in the United States at the present time? The answer is by no means one which may be made off-hand. In order to secure the information given in the accompanying table of registrations letters were written to the Secretary of State of every state and territory, and in the cases where estimates

were necessary the greatest care was observed that the figures should be as accurate as possible. According to the result there are 717,875 automobiles registered in the entire country. This, however, does not mean that there are as many machines as that in use, for cars are very often registered in several states at the same time. This is especially true of cars in New Jersey, New York and Pennsylvania. A careful investigation of this phase of the question reveals the number of duplicate registrations as approximately 41,000. Then the answer to the question is that there are 677,000 automobiles in actual use in the United States today, or one car to every 140 of the population, which is a very high average.

At the beginning of last year all sorts of prophecies, estimates and guesses were made as to the probable output of the American automobile manufacturers during the year. A searching investigation was made of this matter as well, and hundreds of letters were sent to manufacturers all over the country asking for information upon which the computation could confidently

Table Showing Automobile Registrations in the United States for 1911, with the Amount of Fees Collected.

State or Territory	Total Registration	New Registrations, 1911	Registration up to 1911	Commercial Vehicle Registration	Total Registration Fees	Remarks
Alabama.....	2,856	847	2,009	39	\$14,280.00†	New law
Arizona.....	1,485	597	888	14	7,425.00†	Local registration
Arkansas.....	2,866	1,560	1,305	43	7,750.00	New law
California.....	59,202	16,819	42,383	2,063	38,136.00	
Colorado.....	9,483	2,862	6,621	14	47,415.00	Local registration
Connecticut.....	13,994	3,326	10,668	482	207,000.00	
Delaware.....	1,391	588	803	79	13,036.00	
District of Columbia.....	8,322	2,294	6,028	110	10,172.00	
Florida.....	3,889	1,495	2,394	94	2,880.00	
Georgia.....	12,240	4,706	8,134	136	11,400.00	
Idaho.....	3,280	1,046	2,234	24	.....	No state registration
Illinois.....	38,104	10,062	28,042	1,626	350,000.00	New law
Indiana.....	36,826	9,364	27,462	1,442	12,000.00	
Iowa.....	27,936	4,147	23,789	1,094	148,366.00	New law
Kansas.....	8,317	2,847	5,470	115	.....	No state registration
Kentucky.....	2,868	826	2,042	103	20,000.00	
Louisiana.....	4,867	1,742	3,125	43	24,335.00	Local registration
Maine.....	10,045	2,757	7,288	100	11,266.00	New law
Maryland.....	7,370	4,502	2,868	98	63,055.00	
Massachusetts.....	38,696	7,336	31,360	2,120	460,000.00	
Michigan.....	27,740	9,385	18,355	1,226	96,169.00	
Minnesota.....	19,275	7,245	12,029	963	32,400.00	
Mississippi.....	1,240	413	827	36	6,200.00†	
Missouri.....	16,166	2,963	13,203	232	55,998.00	
Montana.....	2,729	748	1,981	36	.....	No state registration
Nebraska.....	23,094	8,326	14,768	242	7,765.00	
Nevada.....	520	215	305	24	.....	No state registration
New Hampshire.....	4,489	913	3,586	78	52,956.00	
New Jersey.....	48,266	10,154	38,112	1,061	374,878.63	
New Mexico.....	1,389	624	765	29	.....	No state registration
New York.....	84,989	22,334	62,655	5,081	882,975.87	
North Carolina.....	3,728	1,533	2,195	76	7,260.00	
North Dakota.....	7,220	2,104	5,116	46	21,545.00	New law
Ohio.....	45,739	12,798	32,941	871	254,719.70	
Oklahoma.....	3,459	1,344	2,115	32	17,245.00†	
Oregon.....	6,007	1,884	4,123	126	25,916.00	New law
Pennsylvania.....	44,182	6,405	37,777	2,062	418,631.00	
Rhode Island.....	6,017	798	5,219	162	73,000.00	
South Carolina.....	7,066	2,260	4,806	106	35,330.00	Local registration
South Dakota.....	11,242	3,327	7,915	112	3,250.00	
Tennessee.....	6,464	2,211	4,253	103	4,000.00	
Texas.....	15,588	5,742	9,846	347	77,940.00	Local registration
Utah.....	1,807	460	1,347	32	986.00	
Vermont.....	3,247	801	2,446	75	59,643.00	
Virginia.....	3,916	1,446	2,470	120	35,574.50	
Washington.....	8,589	2,476	6,113	116	16,000.00	
West Virginia.....	2,091	843	1,248	51	20,458.00	
Wisconsin.....	15,831	4,999	10,832	543	17,752.00	
Wyoming.....	1,728	620	1,102	28	8,640.00	Local registration
Total.....	717,875	194,501	523,384	25,451	\$3,985,848.55	

\*Including non-residents

†Estimated on basis of population with reference to location and sectional registration.

# Industry for the Year

be based. When all the figures were totaled we found that American manufacturers had produced 209,957 cars during the past 12 months. These consisted of 194,665 gasoline pleasure cars, 8,500 gasoline trucks, 5,634 electric pleasure cars, 853 electric trucks and 305 fire department vehicles.

At the beginning of last year people were prophesying, estimating and guessing the number of cars to be produced in 1911, and they are now doing the same thing concerning the 1912 output. This being the case, they will doubtless be interested in what the manufacturers themselves think on the subject. According to estimates given by them in answer to the letters of THE AUTOMOBILE they will produce in all 247,427 cars during the current year. A glance at these figures and at those which show the 1911 output gives a definite idea of the tremendous strides marking the progress of the manufacturing side of the industry from year to year.

Many will ask, Who will buy all those cars? Just think of the great number now in use! The country's buying power is

not altogether unlimited. This brings up another side of the subject which presents a boundless field for speculation. The United States has become the greatest exporter of automobiles in the world. Since 1901 automobile exports from this country have increased in value from \$367,371 to \$15,344,677 at the end of October, 1911. Each succeeding year brings its opportunities in this direction and American manufacturers are not slow to grasp them. In fact, they even invade the foreign countries and make their own opportunities. In connection with this it is interesting to note that imports of automobiles and parts into the United States have steadily decreased in value from \$4,910,208 in 1906 to \$1,924,271 at the end of October, 1911. Figures for November and December on both imports and exports are not available as this article goes to press. A study of the accompanying chart illustrating the fluctuation of the imports and exports of automobiles and parts to and from this country since 1901 reveals some unexpected variations in succeeding years. The year 1910 shows the greatest advance, exports jump-

**Table Showing Distribution by States of Manufactories of the More Important Automobile Parts and Accessories**

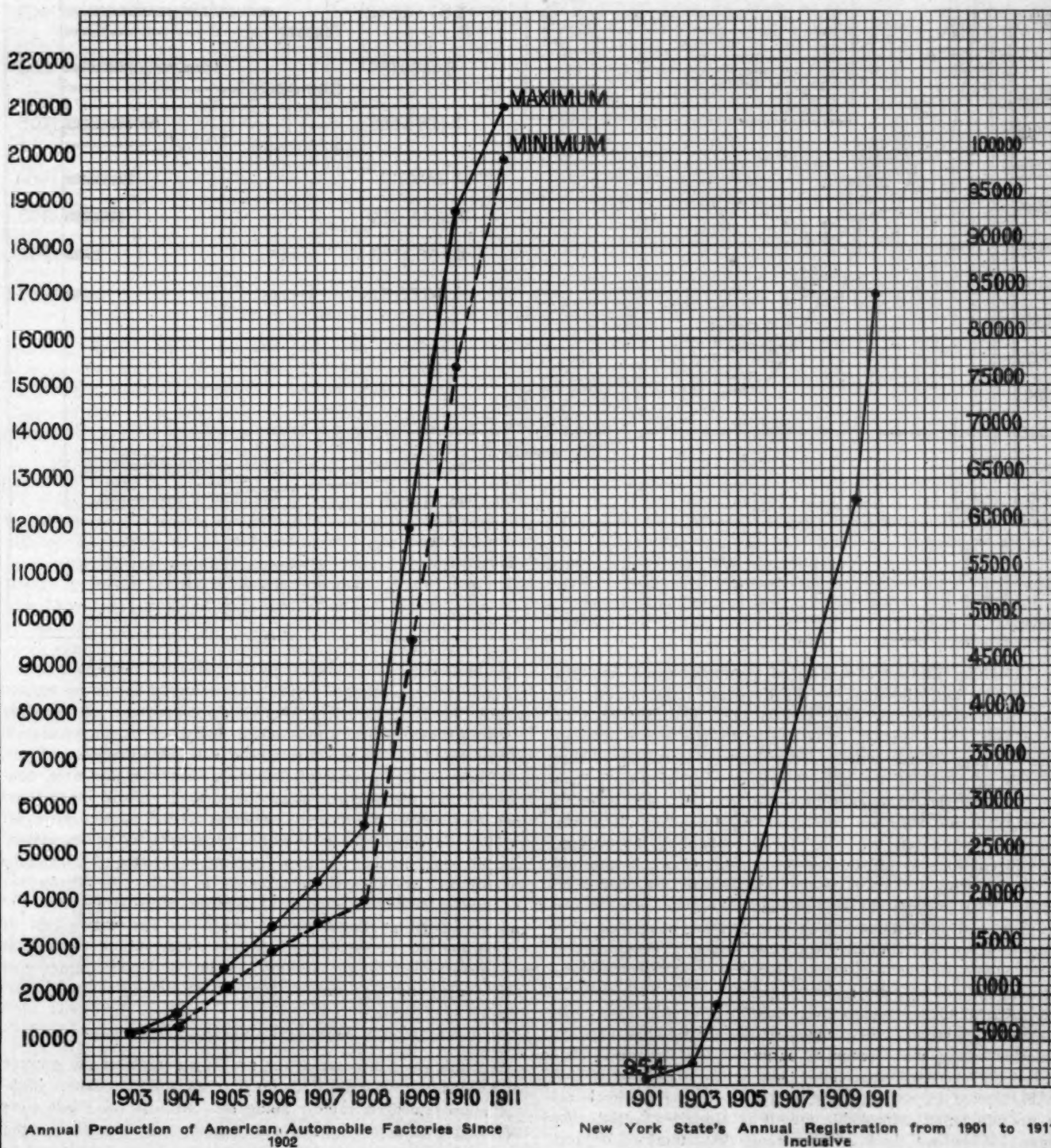
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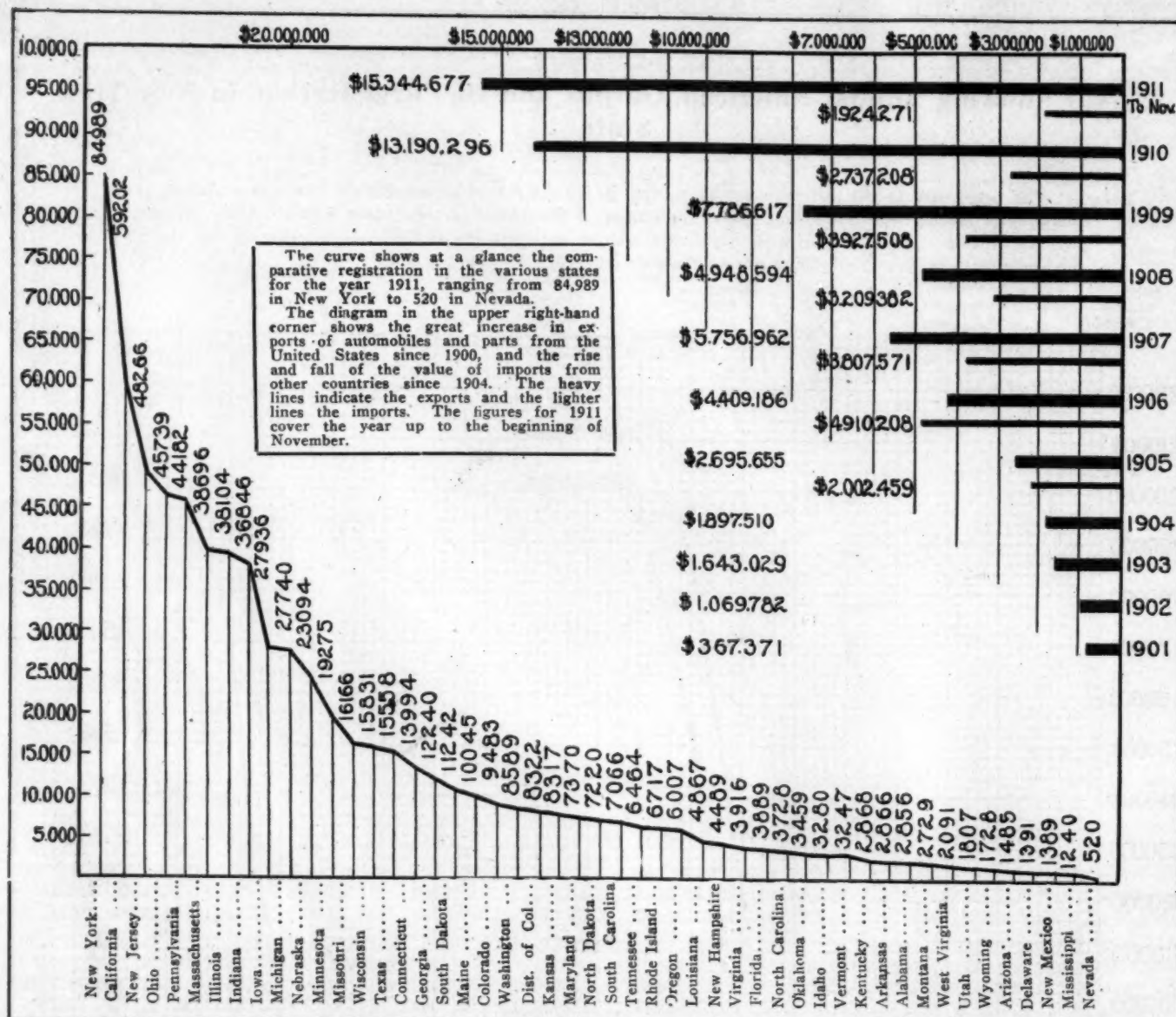
NOTE.—Although the above table shows the number and distribution of manufactures of only the more important automobile parts and accessories, all of these manufacturers do not devote the entire energy of their factories to the production of automobile goods. A large number of them have introduced their automobile specialties as side lines and continue to direct their chief efforts to the manufacture of their original product. Even then many of these makers have tremendous outputs of automobile goods.



## Curves Showing Annual American Output and the Registration in New York State

The heavy line to the left indicates the output of all the American automobile factories, including the scattered products. The dotted line shows the output of the factories concerning which definite information is available. The solid line to the right of the chart indicates the tremendous increase in the use of the automobile in New York State during the past ten years.





ever, by taking the average price of American-made cars for 1911 we find that, allowing for the duplicate registrations, the output for that year represents \$271,604,322. The average price for the year was \$1,245.99, as is shown by the curve depicted on the last page of this article. This chart is interesting in that it reveals at a glance the almost regular rise in the average price of American-made cars until the end of 1907, when it was \$2,137.56, and then the correspondingly regular fall to the present level at the end of 1911. In all probability the average price will continue to fall during the current year. In this respect the growing influence of the second-hand car cannot be ignored. Year by year the second-hand cars must of necessity grow more and more numerous as new cars are bought or misfortune of some sort compels cars owners to sell. And year by year the people, while still clamoring for more cars than the manufacturers can produce, are looking more favorably upon second-hand and rebuilt cars. Attractively low in price and apparently just as efficient as when new, many of the second-hand cars on the market to-day make tempting bargains. As yet their influence has not been felt appreciably, but before very long it will be a big factor in lowering the average price of automobiles. It is not altogether improbable that it is already affecting this average. When we think of the tremendous total of 677,000 cars in use in the United States at the present time and of the expected output of 247,427 cars for this year it is by no means difficult to realize that the second-hand car will never be a negligible quantity.

Another thing which strikingly indicates the magnitude which the industry has attained is the total value of the entire 677,000 cars in this country at the average price for 1911. It amounts to \$800,535,230, which means about \$8.43 per capita population of the country. These cars, at the rate of six shoes per car, cost their owners a total of \$16,000,000 last year for tires, considering \$40 the average price for a shoe. Their inner tubes cost them \$20,000,000 more, considering \$5 the average price for a tube. In other words, the cars used 4,000,000 shoes and at least an equal number of tubes. Gasoline at the rate of 800 gallons per car and at the average price of 15 cents, cost \$81,240,000, the number of gallons used being approximately 541,600,000. Oil and grease added \$20,000,000 to the bill. The entire cost of upkeep per car easily averages \$1,000 a year, which means that the operation of all the automobiles in the United States cost their owners the tidy sum of \$677,000,000 during the past year.

#### Good Roads Work Shows Rapid Progress

With the great increase in the use of automobiles the country has awakened to the need for good roads and everywhere highway improvement is rapidly going on. At first the roads were built and then left to wear out, which was usually a rapid process, but now regular patrol systems are being established to maintain the roads after they are built. Nearly all the states have made appropriations for the purpose and the state highway departments have ceased to become jokes. The total of

AUTOMOBILE MANUFACTURERS AND DISTRIBUTION BY STATES

State or Territory	Gasoline Pleasure Cars	Gasoline Pleasure and Commercial Cars	Steam Pleasure	Steam Commercial	Electric Pleasure Cars	Gasoline Commercial Cars	Electric Commercial Cars	Total
Alabama.....	..	1	..	..	..	..	..	1
California.....	3	..	..	..	..	1	..	4
Colorado.....	1	..	..	..	1	..	1	3
Connecticut.....	5	..	..	..	1	3	..	9
Dist. of Columbia.....	..	..	..	..	..	..	1	1
Georgia.....	2	..	..	..	..	1	..	3
Illinois.....	14	3	..	..	2	17	..	36
Indiana.....	37	5	..	..	1	7	..	50
Iowa.....	3	1	..	..	..	2	..	6
Kansas.....	2	..	..	..	..	1	1	4
Kentucky.....	1	..	..	..	..	1	1	3
Maryland.....	3	..	..	..	1	5	..	18
Massachusetts.....	8	3	1	..	1	5	..	18
Michigan.....	35	9	..	1	4	27	..	76
Minnesota.....	2	1	..	..	..	7	..	10
Missouri.....	5	2	..	..	..	5	..	12
Nebraska.....	1	1	..	..	..	1	..	3
New Jersey.....	3	..	..	..	..	5	1	9
New York.....	14	6	1	1	2	18	3	45
North Carolina.....	1	..	..	..	..	..	..	1
Ohio.....	19	9	1	..	7	23	1	60
Oklahoma.....	2	..	..	..	..	..	..	2
Pennsylvania.....	16	3	..	..	..	9	3	31
Rhode Island.....	1	1	..	..	..	..	..	2
South Dakota.....	1	..	..	..	..	..	..	1
Tennessee.....	1	..	..	..	1	..	..	2
Texas.....	1	..	..	..	..	2	..	3
Virginia.....	1	1	..	..	..	1	..	3
West Virginia.....	1	..	..	..	..	2	..	3
Wisconsin.....	7	4	..	..	..	10	..	24
Total.....	186	51	3	2	20	147	11	420

the state appropriations for the past year amounts to \$110,932,800. New York State furnished \$27,500,000 of this and Texas \$25,000,000, while Pennsylvania appropriated \$11,500,000. In Colorado there is a bond issue of \$10,000,000 to be voted on by the people, and in Pennsylvania there is one of \$50,000,000.

#### Wonderful Increase in Motor Transportation

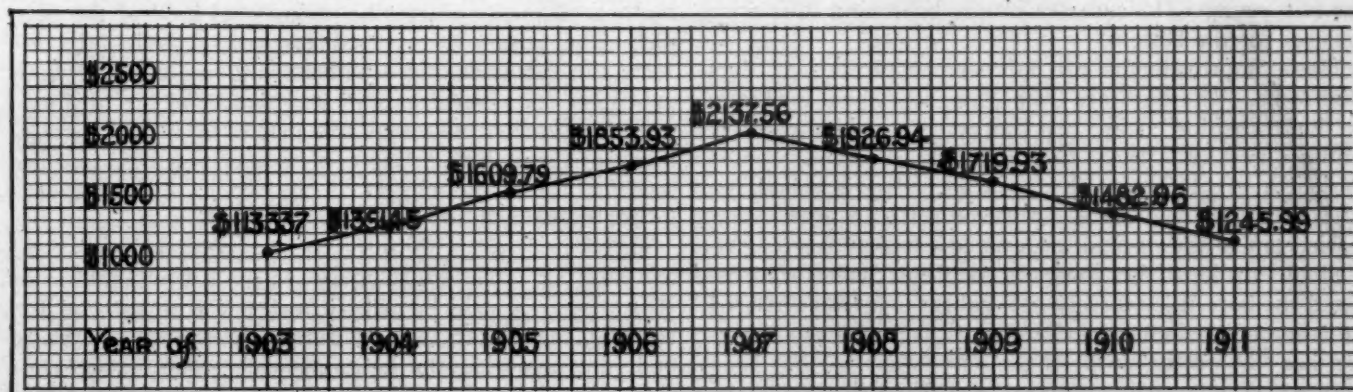
Good roads are becoming more necessary each year, not alone by reason of the rapid increase in pleasure automobiling, but also on account of the growing use of motor trucks. According to the table on page 10, which was compiled with great care, there are 25,451 motor trucks in the United States. New York State alone has 5,081 in active operation. During the year 1911 9,658 commercial vehicles of all sorts were produced by the American truck makers, according to authorized reports from the factories. The value of the trucks now in use, at the average price of \$2,200 per car, is \$55,992,200. "It is no wonder that business men all over the country are giving up the horse delivery for motor-driven trucks as it has been demonstrated that the cost of keeping a two-horse delivery system for a year is about \$2,931, while that of keeping a truck system for the same length of time is only about \$1,480. Yet the census bureau reports that there are 30,000,000 horses in the country as against 14,000,000 in 1900, and that they have jumped in value from \$14.61 the head to \$95.64.

COMPARISON OF NUMBER AND DISTRIBUTION OF SUPPLY STATIONS, DEALERS AND GARAGES IN 1910 AND 1911

State or Territory	Supplies, 1910	Supplies, 1911	Dealers and Garages, 1910	Dealers and Garages, 1911
Alabama.....	..	..	49	65
Arizona.....	..	1	23	30
Arkansas.....	..	..	23	33
California.....	21	27	527	663
Colorado.....	7	5	114	148
Connecticut.....	10	9	236	312
Delaware.....	..	..	22	29
District of Columbia.....	2	6	51	68
Florida.....	..	1	68	80
Georgia.....	4	4	151	198
Idaho.....	..	..	13	21
Illinois.....	38	32	876	1,171
Indiana.....	8	6	430	573
Iowa.....	1	1	380	507
Kansas.....	3	4	222	296
Kentucky.....	1	4	85	114
Louisiana.....	..	1	38	51
Maine.....	2	2	93	124
Maryland.....	4	10	67	90
Massachusetts.....	31	51	520	693
Michigan.....	19	21	363	484
Minnesota.....	9	13	257	346
Mississippi.....	..	..	37	51
Missouri.....	14	22	271	362
Montana.....	1	1	37	50
Nebraska.....	4	5	172	236
Nevada.....	..	..	7	11
New Hampshire.....	..	..	78	102
New Jersey.....	6	9	413	544
New Mexico.....	..	..	16	22
New York.....	89	105	1,233	1,644
North Carolina.....	..	1	49	65
North Dakota.....	..	..	112	148
Ohio.....	21	29	629	809
Oklahoma.....	1	2	101	134
Oregon.....	6	11	65	86
Pennsylvania.....	19	28	737	949
Rhode Island.....	7	6	93	114
South Carolina.....	3	2	71	92
South Dakota.....	..	..	86	124
Tennessee.....	..	1	51	68
Texas.....	2	4	252	336
Utah.....	2	2	32	43
Vermont.....	..	..	81	108
Virginia.....	..	1	76	102
Washington.....	6	11	112	154
West Virginia.....	..	1	45	60
Wisconsin.....	5	8	285	385
Wyoming.....	..	..	16	21
Total.....	331	447	9,765	12,884

And still the scope of the motor truck goes merrily on, growing and expanding from day to day. Thus both horses and trucks seem to be prospering.

To return to the grand total of 677,000 cars in the United States, it is interesting to look at the figures from different viewpoints. It seems like a revelation to think that, considering 10 feet as the average wheelbase, if all the automobiles in the country were placed in a straight line, frame to frame, they would extend over 1,282 miles and would reach from New York City to Des Moines, Ia. If they were placed at intervals of 20 feet they would form a line 3,860 miles long. This would stretch from Portland, Me., to Monterey, Cal., or from New York City across the Atlantic Ocean and the continent of Europe as far as Warsaw, in Russia. At the present rate of manufacturing it would seem as though it will not be so very long before such a line would reach around the world.



Fluctuation in the average price of American automobiles from 1902 to the present time

# THE AUTOMOBILE

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## The Factors of the Year

THIS has been a year of much disturbance in the automobile industry. Many a factory president, factory engineer or factory general manager has lost more sleep during the 12 months just closed than during many previous years.

It has been a year of unexpected happenings. Nobody expected such a country-wide interest in the non-poppet valve motor; nobody anticipated such a landslide of self-starters; nobody looked for such a general move towards longer-stroke motors; and few imagined that electric lighting and six-cylinder motors would receive so much attention.

A little over a year ago the wiseacres said that the end of show usefulness was at hand; that the automobile had become standardized; that interest was already waning in the car and that soon all cars would be so much alike that an automobile show would be a most uninteresting affair. This is far from the truth. There will be more features of interest displayed at the coming exhibitions in Madison Square Garden and at the new Grand Central Palace than were seen at these two shows during the last two years. The cars are simply brimming over with changes for the better.

These improvements are not so conspicuous as they used to be. The days are over when so radical a change as the transition from rear entrance to side entrance tonneau is seen. It is true that the fore-door model worked a great change in appearance, but it called for little alteration in design. Improvements are now being carried out in the decimal order. If a maker has lengthened the stroke of his motor a couple of inches and reduced the bore it is scarcely noticeable; if he has changed the contour of the cam to give more power, one's attention has to be called to it; if the valve diameter has been increased, this, too, is a matter of information from the salesman; so it is also in the matter of reducing noise by fiber inserts in the top of the valve tappets; so likewise

is it with increasing the crankshaft speed by lightening the pistons by perforations or other means, and with the installment of a circulating non-splash lubrication system or the introduction of other means of improved motor oiling. The changes may not be apparent to the average observer, but they are present and they are often of more importance than many of the conspicuous changes of former seasons.

One of the most marked features of the coming shows is the introduction by several American makers of the two-sleeve Knight type of motor. This motor has been taken up body and soul by one maker who has entirely discontinued the poppet-valve type; and the others who have adopted it are meeting with pronounced success. The introduction of this type of non-poppet valve motor has set a score of inventors at work in other parts of the country, and there are many new types being developed. The European conceptions are being infringed upon in some; others are going beyond them, and a few others are trying to resurrect old ideas. In a word there is a wave of invention, a wave of concentration, a wave of study, a wave of research; and where these are combined and backed up by perseverance there is certain to be something to show as a result of the effort expended.

Those who have not cast in their lot with the non-poppet valve class are not idle. They are devising ways and means whereby the poppet valve can be brought to its highest stage of perfection. It is an excellent thing for the poppet valve motor that the sleeve valve has entered and disturbed its blissful sleep. Necessity is the mother of invention, and in this respect the search for silence and efficiency of the sleeve and other valve types has made it necessary for engineers to burn the midnight oil. The result is a happy one. The old poppet type has been made more powerful, it has been made more quiet and it has been made more flexible. The higher efficiency of some non-poppet valve types has brought about increased strength of the standard parts of the motor. It has resulted in heavier crankshafts, heavier camshafts, longer bearings and the use of better metals. The necessary flexibility and desired power have urged carbureter makers to extra efforts, and although they have always been particularly active still they are working today with renewed energy in order to give the maker what he wants. Ignition makers have turned over the various problems until automatic timing of the mechanism has resulted from their efforts.

But the improvement regime has not all been with the motors. The self-starter has taken real hold of the people. The tales of fractured forearms has had its effect; the demands for a self-starting motor have been persistent for several months and thanks to the medium-priced car maker, who took this matter up in real earnest, many of the makers of big cars have been forced into the field. Some of the makers of big cars have been leaders in this movement for several years.

Hand in hand with self-starters has developed electric lighting. The effort now is to get a combination instrument—one which will furnish electric current for starting the motor, for igniting the explosive mixture and for furnishing the lights as well. One or two concerns are already working on electric heaters for winter use; the electric jack is being worked upon, and there is no reason why an electric coil cannot be fitted around

the nozzle in the carbureter, to volatilize the gasoline for a short time when starting in very cold weather.

Buyers at the shows will be agreeably surprised at the progress that has been made in the matter of looking after the comfort of the buyers. These have not been overlooked. Heavier and thicker cushions for the seats, more comfortable upholstery for the back, wider seat space, the extra tonneau seat so placed that it will not cramp the foot, the wider body for the front-seat passenger, the cowled dash, the fore-door, the ventilator for warm weather and a dozen other things all show that the comfort of the buyer has been kept in mind more than in previous years. A ride in many of the cars will also demonstrate satisfactorily that a better body suspension has been obtained and that now traveling in the tonneau is bereft of many of those bad road incidents so common with many cars a year ago. Springs have been improved; the body is better suspended between the axles; auxiliary shock-absorbing means have been used—all of which have profited the owner.

Cars are more accessible than they used to be. It does not take so long to adjust a brake as it did two years ago. It can be done on many cars by simply raising the front seat floor-boards. Grease cups are more accessible. The water pump can now be taken off without removing the radiator. It is now possible to take the magneto off without being compelled to remove the mud apron. The carbureter is so placed that the needle valve can be reached without dropping one side of the sod pan. Oil can now be drained out of the crankcase without the driver getting under the motor in order to find a mud-covered drain cock in the base of the crankcase. The oil filler pipes for the crankcase have funnel-shaped mouths so that the oil is not now spilled over the entire motor instead of reaching the crankcase.

And there are many other improvements. Several

makers last year had a lot of broken wheels. They kept the facts quiet, but the wheels broke all the same. They broke in hill-climbs, when taking curves at speed; they broke on rough roads in reliability runs; and a few broke in road races. Wherever they broke last year they have been made stronger for next season. This is progress. Some of the cars in 1911 had inadequate radiator capacity. It was adequate for New York and Illinois, but quite insufficient for the hot days of Texas and Oklahoma. These have been changed so that now the owner need not be afraid of being compelled to maintain a pace of 19 miles per hour on the Texas roads in order to keep the radiator from steaming.

The lubricating supply has been increased. Makers of automobiles which a couple of years ago could not go over 100 miles on one filling of oil are now advertising that their cars will run 1000 miles on one filling of oil. This is as it should be. A trip of a week through an unknown section of the country is not such a matter of concern now as it used to be. It is no longer necessary to ship supplies of special cylinder oil ahead. Many of the motors have capacity enough to insure the owner getting from one big city to another.

Everything is working for the good of the buyer. He has to pay extra, but not much. Many of the car makers have been looking around for something extra to give away as stock equipment and they were overjoyed when the self-starter came around. Demountable rims are becoming common as stock equipment. So it is with electric lights, with tops, with windshields and with many other parts. The owner should really feel that 1911 has been a season of progress for him. Not a year of spectacular progress, it is true, but of progress which goes to simplify the operation of a car as well as to reduce the expense. It has been a good year. If some makers have gone backwards, it has been their own fault.

## The Automobiles of 1912

**F**OLLOWING its custom established years ago THE AUTOMOBILE publishes on the following pages the complete specifications of nearly all of the chassis for 1912 pleasure car types. Some models are not included because of late arrival or because the makers have not yet definitely decided on some of the car characteristics. These specifications are of chassis and not of particular car models. Many makers mount three or four different bodies on the same chassis without the slightest change in any respect. There are other makers who use practically the same general chassis details, but employ a wheelbase a few inches longer for one body type than for another. In such cases, where wheelbases or even tire sizes vary, a separate chassis is listed in the specifications.

These tabulations tell in condensed form the automobile history of the present year; they tell what features the engineers have been working upon for the last year or perhaps more. To facilitate comparisons of horsepower the Society of Automobile Engineers rating is used, this being the same rating as was used by the Association of Licensed Automobile Manufacturers until that body became inactive, when the rating was turned over to the engineering society and is now known as the S. A. E. rating. Not only is the horsepower given but the piston displacement is also set forth, by piston displacement being meant the number of cubic inches of piston volume that is vacated

by the pistons in their reciprocation. Piston displacement is largely used as a basis of classification for cars in contests and this tabulation gives the entire field at a glance.

There are many features of importance that present themselves to the reader who passes but a moment in studying the different phases of car construction recorded in these columns. The growth of six-cylinder motors will be noted; so will the unexpected increase in the use of monobloc casting for four and six-cylinder motors; so will the increase in the stroke of many of the motors and the gradual reduction in the number of square motors—that is, those with the bore equal to the stroke. The preponderance of shaft-drive cannot be overlooked; the even race between cone and multiple-disk clutches attracts attention; the gradual but certain increase of the floating axle is shown; magneto ignition is now seen everywhere; and the employment of the three-quarter elliptic rear spring is noticeable. The non-poppet valve motor records its appearance for the first time in these annual tabulations.

For the convenience of those readers who want to readily grasp the price classification of cars a separate tabulation is given elsewhere in which nearly every model in the country is listed with its price, horsepower, wheelbase and tire sizes. For convenience in this tabulation the entire car field is divided into four price groups.

# Table of Specifications of American

NAME AND MODEL	MOTOR														
	No. of Cylinders	Bore	Stroke	H.P.S.A.E.	Piston Displacement	Cylinder Type	Cylinder How Cast	Valve Location	COOLING		IGNITION			CARBURETION	
									Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed
Abbott-Detroit 30.....	4	4 1/2	4 1/2	27.3	227.2	L. Head.	Pairs....	S. & H....	Pump....	Cellular..	Dual.....	Splitdorf..	Hand....	Stromberg..	Gravity.. Spl....
Abbott-Detroit 44.....	4	4 1/2	5 1/2	32.4	349.9	L. Head.	Pairs....	S. & H....	Pump....	Cellular..	Dual.....	Splitdorf..	Hand....	Stromberg..	Gravity.. Spl....
Adams-Farwell 9*.....	5	5 1/2	5	60.5	594.0	I. Type..	Sep'rate..	In Head..	Air.....	.....	Dual.....	Splitdorf..	Hand....	Own.....	Gravity.. Forced
Alco 40.....	4	5 1/2	5 1/2	44.1	312.0	T. Head.	Pairs....	Opposite..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Newcomb..	Pressure Forced
Alco 60.....	6	4 1/2	5 1/2	54.1	585.1	T. Head.	Pairs....	Opposite..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Newcomb..	Pressure Forced
Alpena 30.....	4	4	4	25.6	201.1	L. Head.	Sep'rate..	L. Side..	Pump....	Tubular..	Dual.....	Remy.....	Hand....	Schebler..	Gravity.. Spl....
Alpena 40.....	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Sep'rate..	L. Side..	Pump....	Tubular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
American 20.....	4	3 1/2	4 1/2	22.5	198.8	L. Head.	En Bloc..	R. Side..	Pump....	Cellular..	Single....	Bosch.....	Hand....	Schebler..	Gravity.. Spl....
American 30.....	4	4 1/2	5 1/2	32.4	318.1	T. Head.	En Bloc..	Opposite..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Rayfield..	Pressure Spl....
American Traveler.....	4	5 1/2	5 1/2	46.0	499.2	L. Head.	Pairs....	R. Side..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Rayfield..	Pressure Forced
American Traveler Spec.	4	5 1/2	5 1/2	46.0	499.2	L. Head.	Pairs....	R. Side..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Rayfield..	Pressure Forced
Ames 43.....	4	4 1/2	5 1/2	27.3	280.6	L. Head.	En Bloc..	L. Side..	Thermal..	Cellular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
Anna.....	2	5 1/2	4	22.0	173.2	L. Head.	Sep'rate..	Side.....	Thermal..	Tubular..	Single....	Bosch.....	Fixed...	Schebler..	Gravity.. Spl....
Apperson 4-45.....	4	4 1/2	5	32.4	318.1	T. Head.	Sep'rate..	Opposite..	Pump....	Cellular..	Dual.....	Eisemann..	Hand....	Rayfield..	Gravity.. Spl....
Apperson 4-55.....	4	4 1/2	5	36.1	354.4	T. Head.	Sep'rate..	Opposite..	Pump....	Cellular..	Dual.....	Eisemann..	Hand....	Rayfield..	Gravity.. Spl....
Apperson 4-65.....	4	5 1/2	5	48.4	475.2	T. Head.	Sep'rate..	Opposite..	Pump....	Tubular..	Dual.....	Bosch.....	Hand....	Own.....	Gravity.. Forced
Arbenz 40.....	4	4 1/2	5 1/2	27.3	280.6	L. Head.	En Bloc..	.....	Pump....	Tubular..	Double...	.....	Hand....	Schebler..	Gravity.. Spl....
Atlas 0.....	4	4 1/2	4 1/2	.....	286.3	2-Cycle..	Pairs....	.....	Pump....	Cellular..	Double...	.....	Hand....	Own.....	Gravity.. In F'l.
Auburn 30-L.....	4	4	4	25.6	201.1	L. Head.	Sep'rate..	L. Side..	Pump....	Tubular..	Dual.....	Remy.....	Hand....	Schebler..	Gravity.. Spl....
Auburn 35-L.....	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Sep'rate..	L. Side..	Pump....	Tubular..	Dual.....	Remy.....	Hand....	Schebler..	Gravity.. Spl....
Auburn 40-N.....	4	4 1/2	5	32.4	318.1	L. Head.	Sep'rate..	L. Side..	Pump....	Tubular..	Dual.....	Remy.....	Hand....	Schebler..	Gravity.. Spl....
Auburn 6-50.....	6	4 1/2	5 1/2	40.9	420.9	L. Head.	Sep'rate..	L. Side..	Pump....	Tubular..	Double...	Bosch.....	Hand....	Schebler..	Gravity.. Spl....
Austin 45.....	6	4 1/2	5 1/2	45.9	473.7	L. Head.	Pairs....	Side.....	Pump....	Tubular..	Double...	Optional..	Hand....	Carter.....	Gravity.. Spl....
Austin 50.....	6	4 1/2	6	48.6	588.6	T. Head.	Sep'rate..	Opposite..	Pump....	Tubular..	Double...	Optional..	Hand....	Carter.....	Gravity.. Spl....
Austin 77.....	6	4 1/2	7	48.6	667.9	I. Type..	Sep'rate..	In Head..	Pump....	Tubular..	Double...	Optional..	Hand....	Carter.....	Pressure Forced
Autocar 24-B.....	4	4 1/2	4 1/2	30.6	270.6	L. Head.	Pairs....	S. & H....	Pump....	Tubular..	Double...	Bosch.....	Hand....	Stromberg..	Pressure Forced
Babcock H.....	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Pairs....	L. Side..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Rayfield..	Gravity.. Spl....
Babcock F.....	4	4 1/2	5	32.4	318.1	L. Head.	Pairs....	R. Side..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Stromberg..	Gravity.. Spl....
Babcock K.....	4	4 1/2	5 1/2	36.1	389.9	T. Head.	Pairs....	Opposite..	Pump....	Cellular..	Dual.....	.....	Hand....	Rayfield..	Gravity.. Spl....
Bergdoll C.....	4	4	4 1/2	25.6	226.2	L. Head.	Bloc.....	S. & H....	Pump....	Cellular..	Single....	Bosch.....	Hand....	Mayer.....	Optional Spl....
Bergdoll D.....	4	4	5 1/2	25.6	266.2	L. Head.	Bloc.....	S. & H....	Pump....	Cellular..	Single....	Bosch.....	Hand....	Mayer.....	Optional Spl....
Berkshire E.....	4	4 1/2	5 1/2	39.0	379.6	T. Head.	Sep'rate..	Opposite..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Schebler..	Gravity.. Forced
Berkshire F.....	6	4 1/2	5 1/2	58.5	569.4	T. Head.	Sep'rate..	Opposite..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Schebler..	Gravity.. Spl....
Brush 1912.....	1	4	5	6.4	62.8	L. Head.	Sep'rate..	Side.....	Thermal..	Tubular..	Single....	.....	Hand....	Kingston..	Gravity.. Spl....
Buick 34.....	4	3 1/2	3 1/2	22.5	165.6	I. Type..	Pairs....	In Head..	Pump....	Tubular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
Buick 35.....	4	3 1/2	3 1/2	22.5	165.6	I. Type..	Pairs....	In Head..	Pump....	Tubular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
Buick 28 and 29.....	4	4	4	25.6	201.1	I. Type..	Pairs....	In Head..	Pump....	Tubular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
Buick 43.....	4	4 1/2	5	32.4	318.1	I. Type..	Pairs....	In Head..	Pump....	Tubular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
Cadillac 1912 1/2.....	4	4 1/2	4 1/2	32.4	286.3	L. Head.	Sep'rate..	R. Side..	Pump....	Tubular..	Double...	.....	Hand....	Own.....	Gravity.. Spl....
Cameron 28.....	4	3 1/2	3 1/2	24	176.9	I. Type..	Sep'rate..	In Head..	Air.....	.....	Optional..	.....	Hand....	.....	Gravity.. Spl....
Cameron 29.....	4	3 1/2	3 1/2	24	176.9	I. Type..	Sep'rate..	In Head..	Air.....	.....	Optional..	.....	Hand....	.....	Gravity.. Spl....
Cameron 30.....	6	3 1/2	3 1/2	36.1	265.4	I. Type..	Sep'rate..	In Head..	Air.....	.....	Optional..	.....	Hand....	.....	Gravity.. Spl....
Cameron 32.....	6	3 1/2	3 1/2	36.1	265.4	I. Type..	Sep'rate..	In Head..	Air.....	.....	Optional..	.....	Hand....	.....	Gravity.. Spl....
Carhartt J.....	4	4 1/2	4 1/2	26.4	233.3	L. Head.	Bloc.....	Side.....	Pump....	Cellular..	Double...	Splitdorf..	Hand....	Stromberg..	Gravity.. Spl....
Carhartt B.....	4	4 1/2	5 1/2	38.0	410.6	T. Head.	Pairs....	Opposite..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Stromberg..	Gravity.. Spl....
Cartercar H.....	4	4	4	25.6	201.1	L. Head.	Pairs....	L. Side..	Pump....	Tubular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
Cartercar R.....	4	4 1/2	4 1/2	27.3	253.9	L. Head.	Pairs....	L. Side..	Pump....	Tubular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
Cartercar S.....	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs....	L. Side..	Pump....	Tubular..	Dual.....	Splitdorf..	Hand....	Schebler..	Gravity.. Spl....
Case 30.....	4	4 1/2	5	28.9	283.6	T. Head.	Pairs....	Opposite..	Pump....	Cellular..	Single....	Remy.....	Hand....	Optional..	Gravity.. Spl....
Case 40.....	4	4 1/2	5 1/2	32.4	334.0	T. Head.	Pairs....	Opposite..	Pump....	Cellular..	Single....	Remy.....	Hand....	Optional..	Gravity.. Spl....
Chadwick 19.....	6	5	6	60	706.8	L. Head.	Pairs....	S. & H....	Pump....	Cellular..	Double...	Bosch.....	Hand....	Own.....	Pressure Forced
Chadwick 19.....	6	5	6	60	706.8	L. Head.	Pairs....	S. & H....	Pump....	Cellular..	Double...	Bosch.....	Hand....	Own.....	Pressure Forced
Chalmers 30.....	4	4	4 1/2	25.6	226.2	L. Head.	Bloc.....	S. & H....	Pump....	Cellular..	Dual.....	Splitdorf..	Hand....	Mayer.....	Optional Spl....
Chalmers 35.....	4	4 1/2	5 1/2	28.9	297.8	L. Head.	Bloc.....	S. & H....	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Rayfield..	Pressure Spl....
Chalmers 12.....	6	4 1/2	5 1/2	43.8	446.7	L. Head.	Threes...	S. & H....	Pump....	Cellular..	Dual.....	Mes.....	Hand....	Rayfield..	Pressure Spl....
Cino 4.....	4	4 1/2	5	30.6	300.7	T. Head.	Pairs....	Opposite..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Stromberg..	Gravity.. Spl....
Cino 6.....	6	4	5	38.4	396.9	T. Head.	Threes...	Opposite..	Pump....	Cellular..	Dual.....	Bosch.....	Hand....	Stromberg..	Gravity.. Spl....
Clark E.....	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Pairs....	L. Side..	Pump....	Cellular..	Dual.....	Remy.....	Hand....	Optional..	Gravity.. Spl....
Clark G.....	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Pairs....	L. Side..	Pump....	Cellular..	Dual.....	Remy.....	Hand....	Optional..	Gravity.. Spl....
Clark T.....	4	4 1/2	4 1/2	26.4	233.3	L. Head.	En Bloc..	On Side..	Pump....	Cellular..	Dual.....	Remy.....	Hand....	Optional..	Gravity.. Spl....

ABBREVIATIONS: S. & H., side and head; R., right; L., left; Thermal, thermo-syphon water circulation; Spl., splash; In F'l., in fuel; Ell., elliptical; Plat., platinum; Spec., special; I-b'm, I-beam; M. Disc, multiple disc; E. B'd, expanding band; C. B'd, contracting band; Exp., expanding; C. & D., cone and disc; D. Pl., dry plate; A. & I., asbestos and iron; A. & S., asbestos and steel; C. I., cast iron; B. & S., bronze and steel; C. & B., cork and bronze; C. & S., cork and steel; F. & S., fibre and steel; F. & I., fibre and iron; Fa. & S., fabric and steel; I. & C., iron and cork; L. & I., leather and iron; L. & S., leather and steel; L. & C., leather and cork; L. & A., leather and as-

# Chassis on the Market for 1912

Motor Lu- rica- tion	Wheelbase	RUNNING GEAR						TRANSMISSION										BEARINGS					
		TIRES		SPRINGS		Front Axle	CLUTCH		GEARSET			Drive	Car Drives Through	Rear Axle	BRAKES		CRANK- SHAFT		Gear- set	Front Wheel	Rear Axle	Steer Knuckle	Steering Gear
		Fr.	Rear	Fr.	Rear		Type	Fric. Surf.	Type	No.	Loca- tion				Ser.	Em.	Type	No.					
pl...	110	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	M.Disc	.....	Select.	3	Amid...	Shaft...	T. & R. R.	Floating...	Ext.	Int.	Plain...	3	.....	Roll.	Roll.	.....	.....
pl...	120	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	S. & R.	Select.	3	Amid...	Shaft...	T. & R. R.	Floating...	Ext.	Int.	Plain...	3	.....	Roll.	Roll.	.....	.....
forced	128	36x4 1/2	36x4 1/2	Ell.	Ell.	Round.	Cone.	Leath'r.	Select.	3	U. Mo.	Chain.	Springs...	Semi-float'g.	Int.	Ext.	Plain...	3	Ball.	Roll.	Roll.	Plain	B & P
forced	126	36x4	36x5	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	4	Amid...	Shaft...	.....	Floating...	Ext.	Int.	Plain...	3	Ball.	Ball.	.....	.....	Plain
forced	134	36x4	36x5	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	4	Amid...	Shaft...	.....	Floating...	Ext.	Int.	Plain...	4	Ball.	Ball.	.....	.....	Plain
pl...	112	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext.	Int.	Plain...	5	Plain	Ball.	Roll.	Plain	Ball
pl...	120	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	S. & R.	Select.	3	U. Mo.	Shaft...	Tor. Tube.	Floating...	Int.	Int.	Plain...	5	Plain	Ball.	.....	Plain	Ball
pl...	105	36x3 1/2	36x3 1/2	Ell.	Ell.	I-b'm...	Cone.	Iron L.	Select.	3	U. Mo.	Shaft...	Tor. Tube.	Floating...	Int.	Int.	Plain...	2	Ball.	Ball.	Ball.	Ball.	Ball
pl...	118	37x4	37x4	Ell.	Ell.	I-b'm...	Cone.	Therm.	Select.	3	Amid...	Shaft...	Tor. Tube.	Floating...	Int.	Int.	Plain...	3	Ball.	Ball.	Ball.	Ball.	Ball
forced	124	40x4	41x4 1/2	Ell.	Ell.	I-b'm...	Cone.	Therm.	Select.	4	Amid...	Shaft...	Tor. Tube.	Floating...	Int.	Int.	Plain...	3	Ball.	Ball.	Ball.	B & P	B & P
forced	140	41x4 1/2	41x4 1/2	Ell.	Ell.	I-b'm...	Cone.	Therm.	Select.	4	Amid...	Shaft...	Tor. Tube.	Floating...	Int.	Int.	Plain...	3	Ball.	Ball.	Ball.	B & P	B & P
pl...	116	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	3	U. Mo.	Shaft...	Springs...	Floating...	Int.	Int.	Plain...	3	Ball.	Ball.	B & R	Plain	Ball
pl...	100	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	M.Disc	S. & P.	Plan.	2	Amid...	Chain.	Rad. Rd.	Dead...	Tran.	Ext.	Plain...	2	.....	Roll.	Roll.	Roll.	Ball
pl...	114	34x4	34x5	Ell.	Ell.	I-b'm...	C. B'd.	S. & B.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext.	Int.	Plain...	5	Ball.	Ball.	B & R	Ball.	Ball
pl...	118	36x4	36x4 1/2	Ell.	Ell.	I-b'm...	C. B'd.	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Ext.	Int.	Plain...	5	Roll.	Ball.	B & R	Ball.	Ball
forced	129	36x4 1/2	37x5	Ell.	Ell.	I-b'm...	C. B'd.	S. & B.	Select.	4	Amid...	Shaft...	Springs...	Semi-float'g.	Ext.	Int.	Plain...	5	B & B.	Roll.	B & R	Ball.	Ball
pl...	120	36x4	36x4	Ell.	Ell.	I-b'm...	Cone.	.....	Select.	3	R. Ax.	Shaft...	Rad. Rd.	Floating...	.....	.....	Plain...	3	Ball.	Ball.	Roll.	.....	Plain
n F1.	128	36x4 1/2	36x4 1/2	Ell.	Ell.	I-b'm...	D. Pl.	Raybes.	Select.	3	U. Mo.	Shaft...	Springs...	Floating...	Ext.	Int.	Roller.	5	Roll.	Roll.	Roll.	Plain	Ball
pl...	112	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	Cone.	L. & S.	Select.	3	Amid...	Shaft...	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain...	5	Ball.	Ball.	.....	Plain	Plain
pl...	116	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	Cone.	L. & I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Ext.	Int.	Plain...	5	Ball.	Ball.	Ball.	Plain	Plain
pl...	120	36x4	36x4	Ell.	Ell.	I-b'm...	Cone.	L. & I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Int.	Int.	Plain...	5	Ball.	Ball.	Ball.	Plain	Plain
pl...	135	37x4 1/2	37x4 1/2	Ell.	Ell.	I-b'm...	M.Disc	T. & S.	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Int.	Int.	Plain...	7	Ball.	Ball.	Ball.	Plain	Plain
pl...	126	36x4 1/2	36x4 1/2	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Ext.	Int.	Plain...	4	Ball.	Ball.	Ball.	Plain	Plain
forced	135	36x4 1/2	36x4 1/2	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Ext.	Int.	Plain...	7	Ball.	Ball.	Ball.	Plain	Plain
forced	117	37x4 1/2	37x4 1/2	Ell.	Ell.	I-b'm...	M.Disc	S. & I.	Select.	3	Amid...	Shaft...	Tor. Tube.	Floating...	Ext.	Int.	Plain...	3	Roll.	Roll.	Roll.	Plain	Plain
forced	141	37x5	37x5	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	4	Amid...	Shaft...	.....	Floating...	Ext.	Int.	Plain...	7	Ball.	Ball.	Ball.	Plain	Plain
pl...	114	34x4	34x4	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Floating...	Int.	Int.	Plain...	3	Roll.	Ball.	Ball.	Ball.	Ball
pl...	120	36x4 1/2	36x4 1/2	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Floating...	Int.	Int.	Plain...	3	Roll.	Ball.	Ball.	Ball.	Ball
pl...	120	36x4 1/2	36x4 1/2	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Floating...	Int.	Int.	Plain...	3	Roll.	Ball.	Ball.	Ball.	Plain
pl...	115	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	M.Disc	S. & T.	Select.	3	U. Mo.	Shaft...	Springs...	Floating...	Ext.	Ext.	Ball...	2	Ball.	Ball.	Ball.	B & P	B & P
pl...	115	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	S. & T.	Select.	4	U. Mo.	Shaft...	Springs...	Floating...	Ext.	Ext.	Ball...	2	Ball.	Ball.	Ball.	B & P	B & P
forced	124	36x4	36x4 1/2	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	3	Amid...	Shaft...	T. & R. R.	Floating...	Ext.	Int.	Plain...	5	Ball.	Ball.	Ball.	Plain	Plain
pl...	134	37x5	37x5	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	4	Amid...	Shaft...	T. & R. R.	Floating...	Ext.	Int.	Plain...	7	Ball.	Ball.	Ball.	Plain	Plain
pl...	80	28x3	28x3	Coil.	Coil.	Wood.	M.Disc	S. & B.	Plan.	2	Amid...	Chain.	Rad. Rd.	Dead...	Int.	.....	Plain...	2	B & P.	Ball.	Ball.	Plain	Plain
pl...	91	32x3 1/2	32x3 1/2	Ell.	Ell.	Tube.	Cone.	L. & I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain...	3	B & P.	Ball.	B & R	Plain	Plain
pl...	102	32x3 1/2	32x3 1/2	Ell.	Ell.	Tube.	Cone.	L. & I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain...	3	B & P.	Ball.	B & R	Plain	Plain
pl...	108	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	Cone.	L. & I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain...	3	B & P.	Ball.	B & R	Plain	Plain
pl...	116	36x4	36x4	Ell.	Ell.	I-b'm...	Cone.	L. & I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Ext.	Int.	Plain...	3	B & P.	Ball.	.....	Plain	Plain
pl...	116	36x4	36x4	Ell.	Ell.	I-b'm...	Cone.	L. & S.	Select.	3	Amid...	Shaft...	Tor. Tube.	Floating...	Ext.	Int.	Plain...	5	Ball.	Roll.	Roll.	Plain	B & P
pl...	104	32x3	32x3	Ell.	Ell.	Tube.	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Floating...	Ext.	Int.	Plain...	3	Ball.	Ball.	Ball.	Plain	Plain
pl...	110	32x3 1/2	32x3 1/2	Ell.	Ell.	Tube.	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Floating...	Ext.	Int.	Plain...	3	Ball.	Ball.	Ball.	Plain	Plain
pl...	114	34x3 1/2	34x3 1/2	Ell.	Ell.	Tube.	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Floating...	Ext.	Int.	Plain...	4	Ball.	Ball.	Ball.	Plain	Plain
pl...	120	34x3 1/2	34x3 1/2	Ell.	Ell.	Tube.	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Floating...	Ext.	Int.	Plain...	4	Ball.	Ball.	Ball.	Plain	Plain
pl...	108	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	Cone.	.....	Select.	3	Amid...	Shaft...	Tor. Tube.	Semi-float'g.	.....	.....	Plain...	3	Roll.	Ball.	Ball.	Plain	Plain
pl...	118	34x4	34x4	Ell.	Ell.	I-b'm...	Cone.	.....	Select.	3	Amid...	Shaft...	Springs...	Floating...	Int.	Ext.	Plain...	3	Roll.	Roll.	Roll.	Plain	Plain
pl...	102	32x3 1/2	32x3 1/2	Ell.	Ell.	I-b'm...	.....	.....	Fric.	.....	Amid...	Chain.	Rad. Rd.	Floating...	Int.	.....	Plain...	3	Ball.	Ball.	Roll.	Plain	Ball
pl...	112	36x4	36x4	Ell.	Ell.	I-b'm...	.....	.....	Fric.	.....	Amid...	Chain.	Rad. Rd.	Floating...	Ext.	Int.	Plain...	3	Ball.	Ball.	Roll.	Plain	Ball
pl...	122	36x4 1/2	36x4 1/2	Ell.	Ell.	I-b'm...	.....	.....	Fric.	.....	Amid...	Chain.	Rad. Rd.	Floating...	Ext.	Int.	Plain...	3	Ball.	Ball.	Roll.	Plain	Ball
pl...	116	34x4	34x4	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	3	Amid...	Shaft...	Rad. Rd.	Semi-float'g.	Int.	Ext.	Plain...	3	Ball.	Plain	.....	.....	.....
pl...	120	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Int.	Ext.	Plain...	3	Ball.	Plain	.....	.....	.....
forced	112	36x4 1/2	36x4 1/2	Ell.	Ell.	I-b'm...	E. B'd.	L. & I.	Select.	4	Amid...	Chain.	Rad. Rd.	Dead...	Tran.	Int.	Plain...	4	Ball.	Ball.	Ball.	B & P	B & P
forced	133	36x4 1/2	37x5	Ell.	Ell.	I-b'm...	E. B'd.	L. & I.	Select.	4	Amid...	Chain.	Rad. Rd.	Dead...	Tran.	Int.	Plain...	4	Ball.	Ball.	Ball.	B & P	B & P
pl...	115	34x00	34x00	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	3	U. Mo.	Shaft...	Tor. Rod.	Floating...	Tran.	Int.	Ball...	2	Ball.	Ball.	Ball.	Plain	Plain
pl...	115	36x00	36x00	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	4	U. Mo.	Shaft...	Tor. Rod.	Floating...	Ext.	Int.	Ball...	2	Ball.	Roll.	Roll.	Plain	Plain
pl...	130	36x4 1/2	36x4 1/2	Ell.	Ell.	I-b'm...	M.Disc	Steel	Select.	4	U. Mo.	Shaft...	Tor. Rod.	Floating...	Ext.	Int.	Ball...	3	Roll.	Roll.	Roll.	Plain	B & P
pl...	116	34x4	34x4	Ell.	Ell.	I-b'm...	Cone.	Leath'r.	Select.	3	Amid...	Shaft...	Tor. Rod.	Floating...	Int.	Ext.	Plain...	3	Ball.	Ball.	Ball.	.....	.....
pl...	130	36x4	36x4	Ell.	Ell.	I-b'm...	Cone.	Leath'r.	Select.	3	Amid...	Shaft...	Tor. Rod.	Floating...	Int.	Ext.	Plain...	3	Ball.	Ball.	Ball.	.....	.....
pl...	116	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	.....	.....	Plain...	3	.....	Roll.	.....	.....	.....
pl...	120	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	.....	.....	Plain...	3	.....	Roll.	.....	.....	.....
pl...	114	34x3 1/2	34x3 1/2	Ell.	Ell.	I-b'm...	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	.....	.....	Plain...	3	.....	Roll.	.....	.....	.....

Spec., R. & I., raybestos and iron; S. & B., steel and bronze; S. & R., steel and raybestos; S. & C., steel and cork; T. & I., thermoid and iron; U. Mo., unit motion; Amid., amidship; T. T. & R. R., torsion tube and radius rod; T. T. & S., torsion tube and spring; T. T. & R., torsion tube and rod; R. R. & S., radius rod and spring; T. & R. R., torsion and radius rod; S. & T. R., spring and torsion rod; I. & E., internal and external; B. & P., ball and plain; B. & R., ball and roller; P. & R., plain and roller. \*Adams-Parwell, revolving cylinder motor. †Cadillac has Delco combined ignition, lighting and starting system.

Table of Specifications of American Chassis on

NAME AND MODEL	MOTOR															
	No. of Cylinders	Bore	Stroke	H.P., S.A.E.	Piston Displacement	Cylinder Type	Cylinder How Cast	Valve Location	COOLING		IGNITION			CARBURETION		Motor Lubrication
									Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed	
Coey 1912	6	4	5	38.4	377.0	T. Head.	Threes...	Opposite..	Pump...	Cellular..	Dual....	Bosch....	Hand....	Schebler...	Pressure.	Spl....
Colby L.	4	4 1/2	4 1/2	26.4	233.3	L. Head.	Bloc....	R. Side...	Pump...	Tubular..	Dual....	Splitdorf..	Hand....	Stromberg.	Gravity..	Spl....
Colby H.	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Pairs....	L. Side...	Pump...	Tubular..	Dual....	Eisemann..	Hand....	Stromberg.	Gravity..	Spl....
Colby J.	4	4 1/2	5 1/2	28.9	297.8	L. Head.	Pairs....	Side....	Pump...	Tubular..	Double...	Remy....	Hand....	Rayfield..	Gravity..	Spl....
Cole 1912	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs....	L. Side...	Pump...	Cellular..	Dual....	Bosch....	Hand....	Schebler...	Gravity..	Spl....
Columbia Cavalier	4	4 1/2	5 1/2	38.0	410.6	T. Head.	Pairs....	Opposite..	Pump...	Cellular..	Double...	Bosch....	Hand....	Stromberg.	Pressure.	Spl....
Columbia Knight	4	4 1/2	5 1/2	38.0	382.6	Sleeve..	Pairs....	In Sleeve.	Pump...	Cellular..	Double...	Bosch....	Hand....	Stromberg.	Pressure.	Forced
Corbitt	4	4	4 1/2	25.6	226.2	L. Head.	Pairs....	R. Side...	Pump...	Cellular..	Dual....	Splitdorf..	Hand....	Panhard..	Gravity..	Forced
Corbin 30	4	4 1/2	4 1/2	32.4	270.4	L. Head.	Sep'rate.	L. Side...	Pump...	Cellular..	Double...	U. & H....	Hand....	Schebler...	Gravity..	Forced
Corbin 40	4	4 1/2	5 1/2	36.1	389.9	T. Head.	Pairs....	Opposite..	Pump...	Cellular..	Double...	U. & H....	Hand....	Stromberg.	Gravity..	Forced
Correja A-B-C.	4	4 1/2	5	28.9	283.6	T. Head.	Pairs....	Opposite..	Pump...	Cellular..	Single...	Simms....	Fixed...	Schebler...	Gravity..	Forced
Correja T-R-S.	4	4 1/2	5	28.9	283.6	T. Head.	Pairs....	Opposite..	Pump...	Cellular..	Single...	Simms....	Fixed...	Schebler...	Pressure.	Forced
Courier 1912	4	3 1/2	5 1/2	22.5	226.4	L. Head.	Bloc....	L. Side...	Thermal..	Tubular..	Single...		Fixed...	Stromberg.	Gravity..	Forced
Crawford 12-30	4	4 1/2	4 1/2	27.3	253.9	L. Head.	Bloc....	L. Side...	Pump...	Tubular..	Dual....	Remy....	Hand....	Stromberg.	Gravity..	Spl....
Crawford 12-35	4	4 1/2	4 1/2	32.4	286.3	L. Head.	Pairs....	L. Side...	Pump...	Tubular..	Dual....	Remy....	Hand....	Stromberg.	Gravity..	Spl....
Crawford 12-40	4	4 1/2	5 1/2	32.4	349.9	L. Head.	Pairs....	R. Side...	Pump...	Tubular..	Dual....	Bosch....	Hand....	Stromberg.	Gravity..	Spl....
Crow-Elkhart 50	4	3 1/2	4 1/2	22.5	198.8	L. Head.	Bloc....	R. Side...	Thermal..	Tubular..	Dual....	Briggs....	Hand....	Schebler...	Gravity..	Spl....
Crow-Elkhart 52	4	4	4 1/2	25.6	226.2	L. Head.	Bloc....	R. Side...	Thermal..	Tubular..	Single...	Briggs....	Hand....	Schebler...	Gravity..	Spl....
Crow-Elkhart 55	4	4 1/2	4 1/2	27.3	253.9	L. Head.	Pairs....	R. Side...	Thermal..	Tubular..	Dual....	Briggs....	Hand....	Schebler...	Gravity..	Spl....
Crow-Elkhart 56	4	4 1/2	5	30.6	300.7	L. Head.	Pairs....	L. Side...	Thermal..	Tubular..	Single...	Briggs....	Hand....	Schebler...	Gravity..	Spl....
Crow-Elkhart 58	4	4 1/2	5	32.4	318.1	L. Head.	Pairs....	R. Side...	Thermal..	Tubular..	Dual....	Briggs....	Hand....	Schebler...	Gravity..	Spl....
Cunningham J.	4	4 1/2	5 1/2	36.1	407.6	I. Type..	Pairs....	Head....	Thermal..	Tubular..	Dual....	Bosch....	Hand....	Stromberg.	Gravity..	Spl....
Cutting A-30	4	4	5	25.6	251.3	L. Head.	Bloc....	L. Side...	Thermal..	Cellular..	Double...	Remy....	Hand....	Chapin....	Gravity..	Forced
Cutting T-55	4	4 1/2	5 1/2	36.1	289.9	T. Head.	Pairs....	Opposite..	Pump...	Cellular..	Double...	Remy....	Hand....	Chapin....	Pressure.	Forced
Dalton 6	4	3 1/2	4 1/2	20.3	175.5	L. Head.	Pairs....	L. Side...	Thermal..	Tubular..	Single...	Bosch....	Hand....	Optional..	Gravity..	Spl....
Davis 40	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Bloc....	L. Side...	Pump...	Tubular..	Dual....	Bosch....	Hand....	Schebler...	Gravity..	Spl....
Day Utility B.	4	4	4 1/2	25.6	226.2	L. Head.	Pairs....	Side....	Pump...	Tubular..	Double...	Bosch....	Hand....	Schebler...	Gravity..	Spl....
DeTamble K-L-M.	4	4 1/2	5	28.9	283.6	L. Head.	Pairs....	L. Side...	Pump...	Cellular..	Dual....	Michigan..	Hand....	Schebler...	Gravity..	Spl....
Dispatch E.	2	3 1/2	5		96.2	2-Cycle..	Sep'rate.		Air....		Single...	Simms....	Hand....	Schebler...	Gravity..	In F'l.
Dispatch G-2	4	3 1/2	5	19.6	192.4	2-Cycle..	Sep'rate.		Air....		Single...	Simms....	Hand....	Schebler...	Gravity..	In F'l.
Dorris G.	4	4 1/2	5	30.6	300.7	L. Head.	Pairs....	In Head..	Pump...	Cellular..	Dual....	Bosch....	Hand....	Stromberg.	Gravity..	Spl....
Duryea Electa.	2	3 1/2	3 1/2		82.8	2-Cycle..	Sep'rate.		Air....		Single...		Hand....	Heitger...	Gravity..	In F'l.
Duryea Buggy Type.	2	3 1/2	3 1/2		82.8	2-Cycle..	Sep'rate.		Air....		Single...		Hand....	Heitger...	Gravity..	In F'l.
Duryea Runabout.	2	3 1/2	3 1/2		82.8	2-Cycle..	Sep'rate.		Air....		Single...		Hand....	Heitger...	Gravity..	In F'l.
Elmore R-26	4	4	3 1/2		175.9	2-Cycle..	Sep'rate.		Thermal..	Tubular..	Dual....	K-W....	Hand....	Schebler...	Gravity..	Spl....
Elmore R-27	4	4	3 1/2		175.9	2-Cycle..	Sep'rate.		Thermal..	Tubular..	Dual....	K-W....	Hand....	Schebler...	Gravity..	Spl....
Elmore 37	4	4 1/2	4		254.5	2-Cycle..	Separate.		Thermal..	Tubular..	Dual....	K-W....	Hand....	Schebler...	Gravity..	Spl....
E-M-F A-1912	4	4	4 1/2	25.6	226.2	L. Head.	Pairs....	L. Side...	Pump...	Tubular..	Dual....	Splitdorf..	Hand....	Own....	Gravity..	Spl....
Everitt 30	4	4	4 1/2	25.6	238.8	L. Head.	Bloc....	L. Side...	Pump...	Cellular..	Dual....	Splitdorf..	Hand....	Own....	Gravity..	Spl....
Everitt 4-35	4	4	4 1/2	25.6	238.8	L. Head.	Bloc....	L. Side...	Pump...	Cellular..	Dual....	Splitdorf..	Hand....	Own....	Gravity..	Spl....
Everitt 6-48	6	4	4 1/2	38.4	358.2	L. Head.	Bloc....	L. Side...	Pump...	Cellular..	Dual....	Splitdorf..	Hand....	Own....	Gravity..	Spl....
Firestone-Columbus 56-D.	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Bloc....	L. Side...	Pump...	Tubular..	Dual....	Mea....	Hand....	Schebler...	Gravity..	Spl....
Firestone-Columbus 60-D.	4	4 1/2	5	32.4	318.1	L. Head.	Pairs....	R. Side...	Pump...	Tubular..	Double...	Mea....	Hand....	Schebler...	Gravity..	Spl....
Firestone-Columbus 68-D.	4	4 1/2	5 1/2	32.4	249.9	L. Head.	Pairs....	L. Side...	Pump...	Tubular..	Double...	Mea....	Hand....	Schebler...	Gravity..	Spl....
Flanders S.	4	3 1/2	3 1/2	20.3	154.8	L. Head.	Bloc....	L. Side...	Pump...	Tubular..	Dual....	Splitdorf..	Hand....	Own....	Gravity..	Spl....
Flanders S.	4	3 1/2	3 1/2	20.3	154.8	L. Head.	Bloc....	L. Side...	Pump...	Tubular..	Dual....	Splitdorf..	Hand....	Own....	Gravity..	Spl....
Ford T.	4	3 1/2	4	22.5	176.7	L. Head.	Bloc....	R. Side...	Thermal..	Tubular..	Single...	Own....	Hand....	Optional..	Gravity..	Spl....
Four Wheel Drive A*	4	4 1/2	5 1/2	36.1	289.9	T. Head.	Pairs....	Opposite..	Pump...	Cellular..	Dual....	Bosch....	Hand....	Optional..	Gravity..	Forced
Franklin G-Runabout.	4	3 1/2	4	18.3	143.1	I. Type..	Sep'rate.	In Head..	Air....		Dual....	Bosch....	Fixed...	Own....	Gravity..	Forced
Franklin G-Touring.	4	4	4	25.6	201.1	I. Type..	Sep'rate.	In Head..	Air....		Dual....	Bosch....	Gov'nor.	Own....	Gravity..	Forced
Franklin 25	4	4	4	25.6	201.1	I. Type..	Sep'rate.	In Head..	Air....		Dual....	Bosch....	Gov'nor.	Own....	Gravity..	Forced
Franklin M.	6	3 1/2	4	31.6	247.6	I. Type..	Sep'rate.	In Head..	Air....		Dual....	Bosch....	Gov'nor.	Own....	Gravity..	Forced
Franklin D.	6	4	4	38.4	301.6	I. Type..	Sep'rate.	In Head..	Air....		Dual....	Bosch....	Gov'nor.	Own....	Gravity..	Forced
Franklin H.	6	4	4	38.4	301.6	I. Type..	Sep'rate.	In Head..	Air....		Dual....	Bosch....	Gov'nor.	Own....	Gravity..	Forced
Frontenac E.	4	4 1/2	5	36.1	354.4	L. Head.	Pairs....	R. Side...	Pump...	Cellular..	Dual....	Splitdorf..	Hand....	Stromberg.	Gravity..	Spl....
Garford G-12†	4	4 1/2	5 1/2	28.9	297.8	L. Head.	Bloc....	L. Side...	Pump...	Cellular..	Dual....	Bosch....	Hand....	Own....	Gravity..	Spl....
Garford G-8†	4	4 1/2	5 1/2	36.1	372.1	T. Head.	Pairs....	Opposite..	Pump...	Cellular..	Dual....	Bosch....	Hand....	Own....	Gravity..	Spl....
Garford G-14†	6	4 1/2	5 1/2	43.8	446.7	L. Head.	Threes...	L. Side...	Pump...	Cellular..	Double...	Bosch....	Hand....	Own....	Gravity..	Spl....
G. J. G. Junior	4	3 1/2	4 1/2	22.5	198.8	L. Head.	Pairs....	L. Side...	Pump...	Cellular..	Dual....	Bosch....	Hand....	Schebler...	Gravity..	Spl....
G. J. G. Senior	4	4	5	36.1	354.4	L. Head.	Pairs....	L. Side...	Pump...	Cellular..	Dual....	Bosch....	Hand....	Schebler...	Optional	Spl....
Gilde	4	4 1/2	5	36.1	354.4	L. Head.	Sep'rate.	R. Side...	Pump...	Cellular..	Dual....	Eisemann..	Hand....	Schebler...	Gravity..	Spl....

ABBREVIATIONS: S. & H., side and head; R., right; L., left; Thermal, thermo-syphon water circulation; Spl., splash; In F'l., in fuel; Ell., elliptical; Plat., platinum; Spec., special; I-b-m, I-beam; M. Disc, multiple disc; E. B'd, expanding band; C. B'd, contracting band; Exp., expanding; C. & D., cone and disc; D. Pl., dry plate; A. & I., asbestos and iron; A. & S., asbestos and steel; C. I., cast iron; B. & S., bronze and steel; C. & B., cork and bronze; C. & S., cork and steel; F. & S., fibre and steel; F. & I., fibre and iron; Fa. & S., fabric and steel; I. & C., iron and cork; L. & I., leather and iron; L. & S., leather and steel; L. & C., leather and cork; L. & A., leather and as-

## the Market for the Season of 1912 — Continued

Wheelbase	RUNNING GEAR					TRANSMISSION										BEARINGS						
	TIRES		SPRINGS		Front Axle	CLUTCH		GEARSET			Drive	Car Drives Through	Rear Axle	BRAKES		CRANK-SHAFT		Gear-set	Front Wheel	Rear Axle	Steer Knuckle	Steering Gear
	Fr.	Rear	Fr.	Rear		Type	Fric. Surf.	Type	No.	Location				Ser.	Em.	Type	No.					
124	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	R. Ax.	Shaft...	Tor. T...	Semi-float'g.	Int...	Ext...	Plain...	3	Ball	Ball	Ball	Ball	
116	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	R. Ax.	Shaft...	T.T. & R.R.	Semi-float'g.	Ext...	Int...	Plain...	2	Roll.	Ball	Roll.	Plain	
121	36x4	36x4	Ell.	Ell.	Box...	M.Disc	Steel...	Select.	3	Amid...	Shaft...	T.T. & R.R.	Floating...	Int...	Int...	Plain...	3	Ball	Ball	Ball	Ball	
112	32x4	32x4	Ell.	Ell.	I-b'm...	Cone...	Raybes	Select.	3	Amid...	Shaft...			Int...	Int...	Plain...	3	Ball	Ball	Ball	Ball	
122	36x4	36x4			I-b'm...	Cone...	L. & S.	Select.	3	U. Mo.	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Ball	Roll.	Roll.	Plain	
120	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Ball	Ball	Roll.	B&P	
129	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	5	Ball	Roll.	Roll.	B&P	
120	34x4	34x4	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo.	Shaft...	T. T. & S.	Semi-float'g.	Ext...	Int...	Plain...	3	Ball	Ball	B&R	Plain	
115	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	B&P...	5	Ball	Ball	Ball	Plain	
120	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Springs...	Floating...	Int...	Ext...	Plain...	3	Ball	Ball	Ball	Plain	
105	34x3	34x3	Ell.	Ell.	I-b'm...	Cone...	L. & S.	Select.	3	R. Ax.	Shaft...	T.T. & R.R.	Semi-float'g.	Ext...	Ext...	Plain...	3	Roll.	Roll.	Roll.	Plain	
125	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & S.	Select.	3	R. Ax.	Shaft...	T.T. & R.R.	Semi-float'g.	Ext...	Ext...	Plain...	3	Roll.	Roll.	Roll.	Plain	
108	28x3	28x3	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Floating...	Ext...	Int...	Ball...	2	Ball	Ball	Ball	Plain	
115	34x3	34x4	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Floating...	Ext...	Int...	Plain...	3	B&R	Ball	Roll.	Plain	
120	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Floating...	Ext...	Int...	Plain...	3	B&R	Ball	Roll.	Plain	
123	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Floating...	Ext...	Int...	Plain...	3	Roll.	Ball	Roll.	Plain	
110	32x3	32x3	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	2	Roll.	Ball	Roll.	Plain	
113	32x3	32x3	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	Roll.	Ball	Roll.	Plain	
116	34x3	34x3	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	R. Ax.	Shaft...	T.T. & R.R.	Semi-float'g.	Ext...	Int...	Plain...	3	B&R	Ball	B&R	Plain	
122	37x4	37x4	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	R. Ax.	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	3	Roll.	Ball	Ball	Plain	
122	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	R. Ax.	Shaft...	Rad. Rd.	Floating...	Int...	Ext...	Plain...	3	B&R	Ball	B&R	Plain	
124	00x4	00x4	Ell.	Ell.	I-b'm...	Cone...	L. & C.	Select.	3	U. Mo.	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Ball	Roll.	Roll.	Plain	
116	34x4	34x4	Ell.	Ell.	I-b'm...	M.Disc	C. I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	Plain	Ball	Roll.	Plain	
116	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	C. I.	Select.	3	Amid...	Shaft...	T.T. & R.R.	Floating...	Ext...	Int...	Plain...	3	Roll.	Ball	B&R	Plain	
106	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	R. Ax.	Shaft...	Springs...	Semi-float'g.	Int...	Int...	Plain...	3	Roll.	Ball	Roll.	Plain	
112	36x4	36x4		Plat.	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...			Plain...	3	Ball	B&R	Plain	Plain	
110	32x3	32x3	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	3	U. Mo.	Shaft...	Springs...	Semi-float'g.	I. & E.	I. & E.	Plain...	3	Plain	Ball	Roll.	Ball	
116	34x4	34x4	Ell.	Ell.	I-b'm...	M.Disc	S. & B.	Select.	3	U. Mo.	Shaft...	T. T. & S.	Floating...	Ext...	Int...	Plain...	3	Ball	Ball	B&R	Plain	
96	36x3	36x3	Ell.	Ell.	Tube...			Fric...		Amid...	Chain...	R. R. & S.	Dead...	Int...		Plain...	3	Roll.	Roll.	Roll.	Plain	
120	36x3	36x3	Ell.	Ell.	Tube...			Fric...		Amid...	Chain...	R. R. & S.	Dead...	Int...		Plain...	3	Roll.	Roll.	Roll.	Plain	
115	36x4	36x4	Ell.	Plat.	I-b'm...	M.Disc	S. & R.	Select.	3	U. Mo.	Shaft...	Springs...	Floating...	Int...	Ext...	Plain...	3	Roll.	Roll.	Roll.	Plain	
80	34x1	40x1	Ell.	Ell.	Channel			Fric...	2	R. Ax.	Roller	Tor. Rod.	Dead...	Ext...		Plain...	4	Roll.	Ball	Ball	Plain	
84	38x1	42x1	Ell.	Ell.	Channel			Fric...	2	R. Ax.	Roller	Tor. Rod.	Dead...	Ext...		Plain...	4	Roll.	Ball	Ball	Plain	
100	30x3	36x3	Ell.	Ell.	Channel			Fric...	2	R. Ax.	Roller	Tor. Rod.	Dead...	Ext...		Plain...	4	Roll.	Ball	Ball	Plain	
108	32x3	32x3	Ell.	Ell.	I-b'm...	E.B'd.	F. & S.	Select.	3	Amid...	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	6	B&P	Ball	Roll.	Plain	
108	32x3	32x3	Ell.	Ell.	I-b'm...	E.B'd.	F. & S.	Select.	3	Amid...	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	6	B&P	Ball	Roll.	Plain	
114	34x4	34x4	Ell.	Ell.	I-b'm...	E.B'd.	F. & S.	Select.	3	Amid...	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	6	B&P	Ball	Roll.	Plain	
112	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	3	Roll.	Ball	Roll.	Plain	
110	34x3	34x3	Ell.	Ell.	I-b'm...	Cone...	L. & S.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.			Plain...	3	P&R	Ball	Roll.	Plain	
115	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	L. & S.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.			Plain...	3	P&R	Ball	Roll.	Plain	
127	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & S.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.			Plain...	3	P&R	Ball	Roll.	Plain	
116	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	F. & I.	Select.	3	Amid...	Shaft...	R. R. & S.	Floating...	Int...	Int...	Plain...	3	Ball	Ball	Ball	Ball	
121	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	F. & I.	Select.	3	Amid...	Shaft...	Tor. Tube.	Floating...	Ext...	Int...	Plain...	3	Ball	Ball	Ball	Ball	
121	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	F. & I.	Select.	3	Amid...	Shaft...	R. R. & S.	Floating...	Int...	Int...	Plain...	3	Ball	Ball	Ball	Ball	
102	30x3	30x3	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	2	B&R	Ball	Roll.	Ball	
102	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	2	B&R	Ball	Roll.	Ball	
100	30x3	30x3	Cross.	Cross.	I-b'm...	M.Disc	Steel...	Plan...	2	U. Mo.	Shaft...	Tor. Tube.	Semi-float'g.									
134	36x4	36x4	Ell.	Ell.	Floating	M.Disc	Steel...	Select.	3	Amid...	Shaft...	R. R. & S.	Floating...			Plain...	3	Ball	Roll.	Roll.	Plain	
100	32x3	32x4	Ell.	Ell.	Tube...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Tran.	Ext...	Plain...	5	Ball	Roll.	Ball	Plain	
103	32x4	32x4	Ell.	Ell.	Tube...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Tran.	Ext...	Plain...	5	Ball	Roll.	Ball	Plain	
108	34x4	34x4	Ell.	Ell.	Tube...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Tran.	Ext...	Plain...	5	Ball	Roll.	Ball	Plain	
116	34x4	34x4	Ell.	Ell.	Tube...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Tran.	Ext...	Plain...	7	Ball	Roll.	Ball	Plain	
123	36x4	37x5	Ell.	Ell.	Tube...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Tran.	Ext...	Plain...	7	Ball	Roll.	Ball	Plain	
126	36x4	37x5	Ell.	Ell.	Tube...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Tran.	Ext...	Plain...	7	Ball	Roll.	Ball	Plain	
123	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	L. & C.	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	3	Ball	Ball	Ball	Plain	
119	34x4	34x4	Ell.	Plat.	I-b'm...	Cone...	L. & C.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	3	Ball	Ball	Ball	Ball	
119	36x4	36x4	Ell.	Plat.	I-b'm...	Cone...	L. & C.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	3	Ball	Ball	Ball	Ball	
138	36x4	37x5	Ell.	Plat.	I-b'm...	Cone...	L. & C.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	3	Ball	Ball	Ball	Ball	
104	32x3	32x3	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo.	Shaft...	Rad. Rd.	Semi-float'g.		Ext...	Plain...	3	Ball	Ball	Ball	Plain	
121	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	Tor. Tube.	Floating...		Ext...	Plain...	3	Ball	Ball	Ball	Plain	
120	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	5	Roll.	Roll.	Roll.	B & P	

bestos; R. & I., raybestos and iron; S. & B., steel and bronze; S. & R., steel and raybestos; S. & C., steel and cork; T. & I., thermoid and iron; U. Mo., unit motion; Amid., amidship; T. T. & R. R., torsion tube and radius rod; T. T. & S., torsion tube and spring; T. T. & R., torsion tube and rod; R. R. & S., radius rod and spring; T. & R. R., torsion and radius rod; S. & T. R., spring and torsion rod; I. & E., internal and external; B. & P., ball and plain; B. & R., ball and roller; P. & R., plain and roller. \*Four-Wheel Drive drives on both front and rear wheels. †Garford has magneto spark plugs.

## Table of Specifications of American Chassis on

NAME AND MODEL	MOTOR																Motor Lubrication
	No. of Cylinders	Bore	Stroke	H.P. S.A.E.	Piston Displacement	Cylinder Type	Cylinder How Cast	Valve Location	COOLING		IGNITION			CARBURETION			
									Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed		
Great Eagle 4-50	4	4 1/2	5	36.1	354.4	L. Head.	Sep. rate.	L. Side...	Pump...	Cellular.	Dual...	Remy....	.....	Stromberg..	.....	.....	
Great Eagle 6-60	6	4 1/2	5 1/2	40.9	420.9	L. Head.	Sep. rate.	L. Side...	Pump...	Cellular.	Dual...	Remy....	Hand...	Stromberg..	Gravity..	.....	
Great Southern 30	4	4	4 1/2	25.6	226.2	L. Head.	Bloc....	R. Side...	Thermal.	Cellular.	Dual...	Bosch....	Hand...	Schebler...	Gravity..	Spl....	
Great Southern 50	4	5 1/2	6	42.0	495.1	L. Head.	Pairs....	R. Side...	Pump...	Cellular.	Double..	Bosch....	Hand...	Stromberg..	Gravity..	Spl....	
Great Western 40	4	4 1/2	5	28.9	283.6	L. Head.	Sep. rate.	S. & H....	Pump...	Tubular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Great Western 40	4	4 1/2	5	28.9	283.6	L. Head.	Sep. rate.	S. & H....	Pump...	Tubular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Grout 35	4	4 1/2	5	32.4	327.0	L. Head.	Sep. rate.	L. Side...	Pump...	Tubular.	Dual...	Bosch....	Hand...	Schebler...	Gravity..	Spl....	
Grout 45	4	4 1/2	5	36.1	354.4	L. Head.	Sep. rate.	L. Side...	Pump...	Cellular.	Dual...	Optional.	Hand...	Schebler...	Gravity..	Spl....	
Halladay 30	4	3 3/4	5 1/2	22.5	231.9	L. Head.	Bloc....	L. Side...	Pump...	Cellular.	Dual...	Splitdorf.	Hand...	Schebler...	Gravity..	Spl....	
Halladay 40	4	4 1/2	5	32.4	318.1	L. Head.	Sep. rate.	L. Side...	Pump...	Cellular.	Double..	Bosch....	Hand...	Schebler...	Pressure.	Spl....	
Halladay 50	4	4 1/2	5	36.1	354.4	L. Head.	Sep. rate.	L. Side...	Pump...	Cellular.	Double..	Bosch....	Hand...	Schebler...	Pressure.	Spl....	
Haynes 20	4	4 1/2	5	28.9	283.6	T. Head.	Pairs....	Opposite.	Pump...	Cellular.	Dual...	Eisemann.	Hand...	Stromberg.	Gravity..	Spl....	
Haynes 21	4	4 1/2	5 1/2	32.4	349.9	T. Head.	Pairs....	Opposite.	Pump...	Cellular.	Dual...	Eisemann.	Hand...	Stromberg.	Gravity..	Spl....	
Haynes Y	4	5	5 1/2	40.0	431.9	T. Head.	Pairs....	Opposite.	Pump...	Cellular.	Dual...	Bosch....	Hand...	Stromberg.	Gravity..	Spl....	
Havers 6-44	6	3 3/4	5	33.8	331.4	L. Head.	Pairs....	R. Side...	Thermal.	Cellular.	Dual...	Bosch....	Hand...	Stromberg.	Gravity..	Spl....	
Henry W	4	4	4 1/2	25.6	226.2	L. Head.	Bloc....	R. Side...	Thermal.	Tubular.	Dual...	Splitdorf.	Hand...	Schebler...	Gravity..	Spl....	
Henry C	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Bloc....	L. Side...	Pump...	Tubular.	Dual...	Splitdorf.	Hand...	Rayfield...	Gravity..	Spl....	
Herreshoff 25	4	3 3/4	3 3/4	18.3	134.2	L. Head.	Bloc....	L. Side...	Thermal.	Tubular.	Single...	Bosch....	Fixed...	Stromberg.	Optional.	Spl....	
Herreshoff 25-Touring	4	3 3/4	3 3/4	18.3	134.2	L. Head.	Bloc....	L. Side...	Thermal.	Tubular.	Single...	Bosch....	Fixed...	Stromberg.	Pressure.	Spl....	
Hudson Roadster	4	4	4 1/2	25.6	226.2	L. Head.	Bloc....	L. Side...	Pump...	Tubular.	Dual...	Bosch....	Hand...	Stromberg.	Pressure.	Spl....	
Hudson Touring	4	4	4 1/2	25.6	226.2	L. Head.	Bloc....	L. Side...	Pump...	Tubular.	Dual...	Bosch....	Hand...	Stromberg.	Gravity..	Spl....	
Hupmobile Runabout	4	3 3/4	3 3/4	16.9	149.1	L. Head.	Pairs....	L. Side...	Thermal.	Tubular.	Single...	Bosch....	Fixed...	Breeze....	Gravity..	Spl....	
Hupmobile Touring	4	3 3/4	3 3/4	16.9	149.1	L. Head.	Pairs....	L. Side...	Thermal.	Tubular.	Single...	Bosch....	Fixed...	Breeze....	Gravity..	Spl....	
Illinois 1912	4	4 1/2	4 1/2	28.9	269.4	L. Head.	Pairs....	L. Side...	Pump...	Cellular.	Double..	Remy....	Hand...	Schebler...	Pressure.	Spl....	
Imperial 32-33	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Pairs....	L. Side...	Thermal.	Tubular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Imperial 34	4	4 1/2	5 1/2	29.3	306.7	L. Head.	Pairs....	L. Side...	Thermal.	Tubular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Imperial 44	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs....	L. Side...	Thermal.	Tubular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Imperial 50-51	4	4 1/2	5 1/2	36.1	372.1	L. Head.	Pairs....	L. Side...	Thermal.	Tubular.	Dual...	Remy....	Hand...	Optional...	Gravity..	Spl....	
Inter-State 30-A	4	4 1/2	5	32.4	318.1	L. Head.	Pairs....	L. Side...	Pump...	Cellular.	Double..	U. & H....	Hand...	Special....	Gravity..	Spl....	
Inter-State 40*	4	4 1/2	5 1/2	32.4	349.9	L. Head.	En bloc.	L. Side...	Pump...	Cellular.	Double..	U. & H....	Hand...	Special....	Pressure.	Spl....	
Inter-State 50	4	5	6	40.0	471.2	T. Head.	Pairs....	Opposite.	Pump...	Cellular.	Double..	U. & H....	Hand...	Special....	Pressure.	Spl....	
Jackson 26-28	4	4	4	25.6	201.1	L. Head.	Pairs....	L. Side...	Thermal.	Cellular.	Dual...	Splitdorf.	Hand...	Schebler...	Gravity..	Spl....	
Jackson 32	4	4	4	25.6	201.1	L. Head.	Pairs....	L. Side...	Thermal.	Cellular.	Dual...	Kingston.	Hand...	Schebler...	Gravity..	Spl....	
Jackson 42	4	4 1/2	4 1/2	32.4	286.3	I. Type.	Pairs....	Head...	Thermal.	Cellular.	Dual...	Kingston.	Hand...	Schebler...	Gravity..	Spl....	
Jackson 52	4	4 1/2	4 1/2	36.1	336.7	I. Type.	Pairs....	In Head...	Thermal.	Cellular.	Dual...	Kingston.	Hand...	Schebler...	Gravity..	Spl....	
Jenkins 50	4	4 1/2	5 1/2	36.1	389.9	T. Head.	.....	Opposite.	.....	.....	Dual...	Bosch....	.....	.....	.....	.....	
Johnson A	4	4 1/2	4 1/2	28.9	255.6	L. Head.	Pairs....	L. Side...	Pump...	Cellular.	Dual...	Splitdorf.	Hand...	Stromberg.	Gravity..	Spl....	
Johnson B	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs....	L. Side...	Pump...	Cellular.	Dual...	Bosch....	Hand...	Stromberg.	Gravity..	Spl....	
Johnson C	4	5	5 1/2	40.0	431.9	L. Head.	Pairs....	L. Side...	Pump...	Cellular.	Dual...	Bosch....	Hand...	Stromberg.	Gravity..	Spl....	
Jonz B	3	3 3/4	4 1/2	.....	225.9	2-Cycle.	Sep. rate.	.....	Thermal.	Tubular.	Dual...	Bosch....	Hand...	Own.....	Gravity..	Forced	
Jonz B (Air-cooled)	3	3 3/4	4 1/2	.....	225.9	2-Cycle.	Sep. rate.	.....	Air.....	.....	Dual...	Bosch....	Hand...	Own.....	Gravity..	Forced	
Jonz D	4	4 1/2	5 1/2	32.4	349.9	L. Head.	Pairs....	L. Side...	Pump...	Cellular.	Dual...	Bosch....	Hand...	Schebler...	Pressure.	Spl....	
Kenmore D	4	3 3/4	3 1/2	18.3	116.3	L. Head.	Bloc....	L. Side...	Thermal.	Tubular.	Single...	Bo ch....	Fixed...	Optional...	Gravity..	Spl....	
King 36	4	3 1/2	5 1/2	23.2	234.0	L. Head.	Bloc....	Side.....	Thermal.	Tubular.	Dual...	Bosch....	Hand...	Special....	Gravity..	Spl....	
Kisselkar 30	4	4 1/2	4 1/2	28.9	241.1	L. Head.	Pairs....	Side.....	Pump...	Tubular.	Dual...	Optional.	Hand...	Stromberg.	Gravity..	Spl....	
Kisselkar 40	4	4 1/2	4 1/2	32.4	302.2	L. Head.	Pairs....	Side.....	Pump...	Tubular.	Dual...	Optional.	Hand...	Stromberg.	Gravity..	Spl....	
Kisselkar 50	4	4 1/2	5	38.0	373.3	L. Head.	Pairs....	Side.....	Pump...	Tubular.	Dual...	Optional.	Hand...	Stromberg.	Gravity..	Spl....	
Kisselkar 60	6	4 1/2	4 1/2	48.6	454.3	L. Head.	Pairs....	Side.....	Pump...	Tubular.	Dual...	Optional.	Hand...	Stromberg.	Gravity..	Spl....	
Klinekar 4-30	4	4	4 1/2	25.6	232.5	L. Head.	Sep. rate.	R. Side...	Pump...	Tubular.	Double..	Bosch....	Hand...	Flechter...	Gravity..	Spl....	
Klinekar 4-40	4	4 1/2	5 1/2	28.9	312.0	T. Head.	Pairs....	Opposite.	Pump...	Tubular.	Double..	Bosch....	Hand...	Flechter...	Gravity..	Spl....	
Klinekar 6-50	6	4 1/2	5	40.2	394.5	T. Head.	Sep. rate.	Opposite.	Pump...	Tubular.	Double..	Bosch....	Hand...	Flechter...	Gravity..	Spl....	
Klinekar 6-60	6	4 1/2	5 1/2	43.8	468.0	T. Head.	Pairs....	Opposite.	Pump...	Tubular.	Double..	Bosch....	Hand...	Flechter...	Gravity..	Spl....	
Knox R	4	5	4 1/2	40.0	373.0	I. Type.	Sep. rate.	In Head...	Pump...	Tubular.	Double..	Bosch....	Hand...	Stromberg.	Gravity..	Forced	
Knox R	4	5	4 1/2	40.0	373.0	I. Type.	Sep. rate.	In Head...	Pump...	Tubular.	Double..	Bosch....	Hand...	Stromberg.	Gravity..	Forced	
Knox R-45	4	5	5 1/2	40.0	431.9	I. Type.	Sep. rate.	In Head...	Pump...	Tubular.	Double..	Bosch....	Hand...	Stromberg.	Gravity..	Forced	
Knox S	6	5	4 1/2	60.0	459.5	I. Type.	Pairs....	In Head...	Pump...	Tubular.	Double..	Bosch....	Hand...	Stromberg.	Gravity..	Forced	
Krit A	4	3 3/4	4	22.5	132.7	L. Head.	Bloc....	R. Side...	Thermal.	Tubular.	Single...	Bosch....	Fixed...	Stromberg.	Gravity..	Spl....	
Krit K	4	3 3/4	4	22.5	132.7	L. Head.	Bloc....	R. Side...	Thermal.	Tubular.	Single...	Bosch....	Fixed...	Stromberg.	Gravity..	Spl....	
Lambert 66-B	4	4 1/2	4 1/2	27.3	240.5	L. Head.	Bloc....	L. Side...	Pump...	Tubular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Lambert 66-C	4	4 1/2	4 1/2	27.3	240.5	L. Head.	Bloc....	L. Side...	Pump...	Tubular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Lambert 99-C	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Sep. rate.	L. Side...	Pump...	Tubular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Lambert 99-B	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Sep. rate.	L. Side...	Pump...	Cellular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Lambert 99-A	4	4 1/2	5	32.4	318.1	L. Head.	Sep. rate.	L. Side...	Pump...	Cellular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Leader 40	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs....	L. Side...	Thermal.	Cellular.	Dual...	Remy....	Hand...	Schebler...	Gravity..	Spl....	
Lenox	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Pairs....	Side.....	Pump...	Cellular.	Dual...	.....	Hand...	Sauer.....	Gravity..	Forced	

ABBREVIATIONS: S. & H., side and head; R., right; L., left; Thermal, thermo-syphon water circulation; Spl., splash; In F., in fuel; Ell., elliptical; Plat., platinum; Spec., special; I-b-m, I-beam; M. Disc, multiple disc; E. B'd, expanding band; C. B'd, contracting band; Exp., expanding; C. & D., cone and disc; D. Pl., dry plate; A. & I., asbestos and iron; A. & S., asbestos and steel; C. I., cast iron; B. & S., bronze and steel; C. & B., cork and bronze; C. & S., cork and steel; F. & S., fibre and steel; F. & I., fibre and iron; Fa. & S., fabric and steel; I. & C., iron and cork; L. & I., leather and iron; L. & S., leather and steel; L. & C., leather and cork; L. & A., leather and as-

## the Market for the Season of 1912 — Continued

Wheelbase	RUNNING GEAR				TRANSMISSION										BEARINGS							
	TIRES		SPRINGS		Front Axle	CLUTCH		GEARSET			Drive	Car Drives Through	Rear Axle	BRAKES		CRANK-SHAFT		Gear-set	Front Wheel	Rear Axle	Steer Kn'te	Steering Gear
	Fr.	Rear	Fr.	Rear		Type	Fric. Surf.	Type	No.	Location				Ser.	Em.	Type	No.					
135	36x00	.....	.....	.....	I-b'm...	Cone...	.....	Select.	3	Amid...	Shaft...	.....	Floating...	Ext...	Int...	.....	.....	Roll...	Roll...	.....	.....	
138	36x4	37x5	.....	.....	I-b'm...	Cone...	L. & S.	Select.	3	Amid...	Shaft...	.....	Floating...	Ext...	Int...	.....	.....	Roll...	Roll...	.....	.....	
113	34x4	34x4	Ell...	Ell...	I-b'm...	M.Disc	S. & R.	Select.	3	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Int...	Ext...	Plain...	2	Ball...	Ball...	Ball...	Plain	
128	00x4	00x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	Tor. Tube	Floating...	Int...	Ext...	Plain...	3	Roll...	Roll...	Roll...	Plain	
114	34x3	34x3	Ell...	Ell...	I-b'm...	Cone...	Raybes.	Select.	3	Amid...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Plain...	5	Roll...	Ball...	Roll...	Plain	
114	35x4	35x4	Ell...	Ell...	I-b'm...	Cone...	Raybes.	Select.	3	Amid...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Plain...	5	Roll...	Ball...	Roll...	Plain	
116	34x4	34x4	Ell...	Plat...	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Ext...	Int...	Plain...	5	Roll...	Ball...	Roll...	Plain	
123	36x4	36x4	Ell...	Plat...	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	5	Roll...	Roll...	Roll...	Ball	
114	32x3	32x3	Ell...	Ell...	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Rad. Rd.	Semi-float'g.	Int...	Int...	Plain...	3	Ball...	Ball...	Roll...	B&P.	
119	36x4	36x4	Ell...	Ell...	Channel	M.Disc	Steel...	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Int...	Int...	Plain...	5	Ball...	Ball...	Ball...	B&P.	
128	36x4	36x4	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	Amid...	Shaft...	Rad. Rd.	Floating...	Int...	Int...	Plain...	5	Ball...	Ball...	Ball...	B&P.	
114	34x4	34x4	Ell...	Ell...	I-b'm...	C.B'd.	S. & B.	Select.	3	U. Mo...	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Roll...	Roll...	Roll...	Plain	
120	36x4	36x4	Ell...	Ell...	I-b'm...	C.B'd.	S. & B.	Select.	3	U. Mo...	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Roll...	Roll...	Roll...	Roll	
127	36x4	37x5	Ell...	Ell...	I-b'm...	C.B'd.	S. & B.	Select.	3	U. Mo...	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Roll...	Roll...	Roll...	Plain	
122	36x4	36x4	Ell...	Plat...	I-b'm...	M.Disc	S. & R.	Select.	3	U. Mo...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	4	Ball...	Ball...	B&R	Plain	
115	34x4	34x4	Ell...	Ell...	I-b'm...	M.Disc	S. & R.	Select.	3	R. Ax...	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	2	Roll...	Ball...	B&R	Plain	
116	34x4	34x4	Ell...	Ell...	I-b'm...	M.Disc	S. & R.	Select.	3	U. Mo...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	3	Ball...	Ball...	B&R	B&P.	
100	32x3	32x3	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Plain...	2	Plain	Ball...	B&R	Plain	
110	32x3	32x3	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Plain...	2	Plain	Ball...	B&R	Plain	
114	32x4	32x4	Ell...	Ell...	I-b'm...	M.Disc	S. & C.	Select.	3	U. Mo...	Shaft...	Tor. Tube	Floating...	Ext...	Int...	Plain...	2	Ball...	Roll...	Roll...	Ball	
114	34x4	34x4	Ell...	Ell...	I-b'm...	M.Disc	S. & C.	Select.	3	U. Mo...	Shaft...	Tor. Tube	Floating...	Ext...	Int...	Plain...	2	Ball...	Roll...	Roll...	Ball	
86	30x3	30x3	Ell...	.....	I-b'm...	M.Disc	Steel...	Select.	2	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Int...	Ext...	Plain...	3	Plain	Roll...	Roll...	Plain	
110	30x3	31x3	Ell...	.....	I-b'm...	M.Disc	Steel...	Select.	2	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Int...	Ext...	Plain...	3	Plain	Roll...	Roll...	Plain	
120	36x3	37x4	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	Amid...	Shaft...	T.T.&R.R.	Floating...	Int...	Int...	Plain...	3	Ball...	Ball...	Ball...	Ball	
114	34x3	34x3	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Plain...	3	.....	Ball...	Roll...	Plain	
116	34x4	34x4	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Plain...	3	.....	Ball...	Roll...	Plain	
120	36x4	36x4	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo...	Shaft...	Tor. Tube	Floating...	Ext...	Int...	Plain...	3	.....	Ball...	Roll...	Plain	
118	34x4	34x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	.....	Ball...	Roll...	Plain	
118	34x4	34x4	Ell...	Ell...	T-b'm...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Tor. Tube	Semi-float'g.	Int...	Ext...	Plain...	3	Ball...	Ball...	Ball...	Ball	
118	36x4	36x4	Ell...	Ell...	T-b'm...	M.Disc	S. & B.	Select.	3	Amid...	Shaft...	Tor. Tube	Floating...	Int...	Ext...	Plain...	3	Ball...	Ball...	Ball...	Ball	
124	36x4	36x4	Ell...	Ell...	T-b'm...	M.Disc	S. & B.	Select.	4	Amid...	Shaft...	Tor. Tube	Floating...	Int...	Ext...	Plain...	3	Ball...	Ball...	Ball...	Ball	
110	32x3	32x3	Ell...	Ell...	I-b'm...	Cone...	L. & I.	Select.	3	U. Mo...	Shaft...	Rad. Rd.	Semi-float'g.	.....	.....	Plain...	3	B&P.	Ball...	B&R	Plain	
110	32x3	32x3	Ell...	Ell...	I-b'm...	Cone...	L. & I.	Select.	3	U. Mo...	Shaft...	Rad. Rd.	Semi-float'g.	.....	.....	Plain...	3	B&P.	Ball...	B&R	Plain	
118	34x4	34x4	Ell...	Ell...	I-b'm...	M.Disc	Iron...	Select.	3	U. Mo...	Shaft...	Rad. Rd.	Semi-float'g.	.....	.....	Plain...	3	B&P.	Ball...	B&R	Plain	
124	36x4	36x4	Ell...	Ell...	I-b'm...	M.Disc	L. & I.	Select.	3	U. Mo...	Shaft...	Rad. Rd.	Semi-float'g.	.....	.....	Plain...	5	B&P.	Ball...	B&R	Plain	
118	36x00	36x00	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Prog.	3	.....	Shaft...	.....	Floating...	.....	.....	.....	.....	Roll...	Roll...	.....	.....	
112	34x3	34x3	Ell...	Ell...	Channel	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	T.T.&R.R.	Floating...	Int...	Int...	Plain...	3	Ball...	Ball...	Ball...	B&P.	
112	36x4	36x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	T.T.&R.R.	Floating...	Int...	Ext...	Plain...	3	Ball...	Ball...	Ball...	B&P.	
124	36x4	36x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	T.T.&R.R.	Floating...	Int...	Ext...	Plain...	3	Ball...	Ball...	Ball...	B&P.	
104	32x3	32x3	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	Amid...	Shaft...	T. T. & S.	Semi-float'g.	Int...	Ext...	Plain...	4	Roll...	Ball...	Roll...	Roll	
104	32x3	32x3	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	Amid...	Shaft...	T. T. & S.	Semi-float'g.	Int...	Ext...	Plain...	4	Roll...	Ball...	Roll...	Roll	
120	36x4	36x4	Ell...	Plat...	I-b'm...	M.Disc	S. & R.	Select.	3	U. Mo...	Shaft...	Tor. Tube	Floating...	Int...	Ext...	Plain...	3	Roll...	Ball...	B&R	Plain	
100	30x3	30x3	Ell...	Ell...	Tube...	M.Disc	Steel...	Select.	2	U. Mo...	Shaft...	.....	Semi-float'g.	Int...	Ext...	Plain...	3	Plain	Ball...	Roll...	Plain	
115	34x4	34x4	Ell...	Plat...	Channel	M.Disc	Steel...	Select.	3	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	.....	.....	Plain...	2	Plain	Ball...	Roll...	Plain	
116	34x4	34x4	Ell...	Ell...	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Ball...	Roll...	Roll...	B&P.	
118	35x4	35x4	Ell...	Ell...	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Ball...	Roll...	Roll...	B&P.	
124	36x4	36x4	Ell...	Ell...	I-b'm...	Cone...	L. & I.	Select.	4	Amid...	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	3	Ball...	Roll...	Roll...	B&P.	
132	37x5	37x5	Ell...	Ell...	I-b'm...	Cone...	L. & I.	Select.	4	Amid...	Shaft...	Springs...	Floating...	Ext...	Int...	Plain...	4	Ball...	Roll...	Roll...	B&P.	
118	34x4	34x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	4	Amid...	Shaft...	Springs...	Floating...	.....	.....	Plain...	5	Ball...	Ball...	B&R	B&P.	
118	36x4	36x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	4	Amid...	Shaft...	Springs...	Floating...	.....	.....	Plain...	5	Ball...	Ball...	B&P.	B&P.	
126	36x4	36x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	4	Amid...	Shaft...	Springs...	Floating...	.....	.....	Plain...	7	Ball...	Ball...	B&P.	B&P.	
130	38x4	38x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	4	Amid...	Shaft...	Springs...	Floating...	.....	.....	Plain...	7	Ball...	Ball...	B&P.	B&P.	
117	36x4	36x4	Ell...	Ell...	I-b'm...	M.Disc	I. & C.	Select.	3	U. Mo...	Shaft...	T. & R. R.	Semi-float'g.	Ext...	Int...	Plain...	5	Ball...	Roll...	Ball...	B&P.	
122	36x4	36x4	Ell...	Ell...	I-b'm...	M.Disc	I. & C.	Select.	3	U. Mo...	Shaft...	T. & R. R.	Floating...	Ext...	Int...	Plain...	5	Ball...	Roll...	Ball...	B&P.	
126	37x5	37x5	Ell...	Ell...	I-b'm...	M.Disc	I. & C.	Select.	3	U. Mo...	Shaft...	T. & R. R.	Floating...	Ext...	Int...	Plain...	5	Ball...	Roll...	Ball...	B&P.	
134	38x5	38x5	Ell...	Ell...	I-b'm...	M.Disc	I. & C.	Select.	3	U. Mo...	Shaft...	T. & R. R.	Floating...	Ext...	Int...	Plain...	4	Ball...	Roll...	Ball...	B&P.	
96	32x3	32x3	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	2	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Ball...	2	Ball...	Ball...	Roll...	Plain	
106	32x3	32x3	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Ball...	2	Ball...	Ball...	Roll...	Plain	
107	32x3	32x3	Ell...	Ell...	Tube...	.....	.....	Fric...	.....	Amid...	Chain...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Ball...	2	Roll...	Ball...	Roll...	Ball	
112	34x3	34x3	Ell...	Ell...	I-b'm...	.....	.....	Fric...	.....	Amid...	Chain...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Ball...	2	Roll...	Ball...	Roll...	Ball	
112	35x4	35x4	Ell...	Ell...	I-b'm...	.....	.....	Fric...	.....	Amid...	Chain...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	5	Roll...	Ball...	Roll...	Ball	
115	35x4	35x4	Ell...	Ell...	I-b'm...	.....	.....	Fric...	.....	Amid...	Chain...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	5	Roll...	Ball...	Roll...	Ball	
115	34x4	34x4	Ell...	Ell...	I-b'm...	.....	.....	Fric...	.....	Amid...	Chain...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	Roll...	Ball...	Roll...	Ball	
124	36x4	36x4	Ell...	Ell...	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo...	Shaft...	S. & T. T.	Floating...	Int...	Int...	Plain...	3	Ball...	Ball...	Ball...	Plain	
116	34x4	34x4	Ell...	Ell...	I-b'm...	Cone...	Leath'r.	Select.	3	R. Ax...	Shaft...	Tor. Tube	Semi-float'g.	Ext...	Int...	Plain...	3	Ball...	Ball...	Ball...	Plain	

bestos; R. & I., raybestos and iron; S. & B., steel and bronze; S. & R., steel and raybestos; S. & C., steel and cork; T. & I., thermoid and iron; U. Mo., unit motion; Amid., amidship; T. T. & R. R., torsion tube and radius rod; T. T. & S., torsion tube and spring; T. T. & R., torsion tube and rod; R. R. & S., radius rod and spring; T. & R. R., torsion and radius rod; S. & T. R., spring and torsion rod; I. & E., internal and external; B. & P., ball and plain; B. & R., ball and roller; P. & R., plain and roller. \*Interstate 40 has Apico combined ignition lighting and starting system.

## Table of Specifications of American Chassis on

NAME AND MODEL	MOTOR																
	No. of Cylinders	Bore	Stroke	H.P., S.A.E.	Piston Displacement	Cylinder Type	Cylinder How Cast	Valve Location	COOLING		IGNITION			CARBURETION		Motor Lubrication	
									Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed		
Lexington DF	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Sep'rate.	L. Side.	Pump...	Cellular.	Double...	Bosch...	Hand...	Schebler...	Pressure.	Spl...	
Lexington F	4	4 1/2	5	32.4	318.1	L. Head.	Sep'rate.	L. Side.	Pump...	Cellular.	Double...	Bosch...	Hand...	Schebler...	Pressure.	Spl...	
Lion 40	4	4 1/2	5	32.4	318.1	L. Head.	Pairs...	S. & H.	Pump...	Tubular.	Dual...	Kingston.	Hand...	Stromberg.	Gravity.	Spl...	
Locomobile L-4	4	4 1/2	4 1/2	32.4	286.3	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Own...	Gravity.	Spl...	
Locomobile M-2	6	4 1/2	4 1/2	48.6	429.5	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Own...	Gravity.	Spl...	
Lozier 46	4	5 1/2	6	46.0	544.6	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Bosch...	Hand...	Own...	Pressure.	Spl...	
Lozier 51	6	4 1/2	5 1/2	51.6	454.4	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Bosch...	Hand...	Own...	Pressure.	Spl...	
Luverne 540	4	4 1/2	4 1/2	30.6	285.6	L. Head.	Pairs...	L. Side.	Pump...	Tubular.	Double...	Bosch...	Hand...	Schebler...	Gravity.	Spl...	
Luverne 750	4	4 1/2	5	36.1	354.4	L. Head.	Sep'rate.	L. Side.	Pump...	Tubular.	Double...	Bosch...	Hand...	Schebler...	Gravity.	Spl...	
Marathon K-20 Road.	4	3 1/2	3 1/2	16.9	116.1	L. Head.	Pairs...	Side.	Thermal.	Tubular.	Dual...	Remy...	Hand...	Kingston.	Gravity.	Spl...	
Marathon K-20 Tour.	4	3 1/2	3 1/2	16.9	116.1	L. Head.	Pairs...	Side.	Thermal.	Tubular.	Dual...	Remy...	Hand...	Kingston.	Gravity.	Spl...	
Marathon L-30	4	4 1/2	4 1/2	25.6	226.2	L. Head.	Pairs...	Side.	Thermal.	Tubular.	Dual...	Remy...	Hand...	Schebler...	Gravity.	Spl...	
Marathon M-40	4	4 1/2	4 1/2	28.9	255.3	L. Head.	Pairs...	Side.	Thermal.	Tubular.	Dual...	Remy...	Hand...	Schebler...	Gravity.	Spl...	
Marathon M-40 Tour.	4	4 1/2	4 1/2	28.9	255.3	L. Head.	Pairs...	Side.	Thermal.	Tubular.	Dual...	Remy...	Hand...	Schebler...	Gravity.	Spl...	
Marathon N-50	4	4 1/2	5 1/2	32.4	326.1	L. Head.	Pairs...	Side.	Thermal.	Tubular.	Dual...	Remy...	Hand...	Schebler...	Gravity.	Spl...	
Marion 35	4	4	4 1/2	25.6	226.2	L. Head.	Sep'rate.	L. Side.	Thermal.	Cellular.	Dual...	Hand...	Hand...	Schebler...	Gravity.	Forced	
Marion 36-37	4	4	5	25.6	251.3	L. Head.	Pairs...	L. Side.	Pump...	Cellular.	Dual...	Hand...	Hand...	Schebler...	Gravity.	Spl...	
Marion 46-47-48	4	4 1/2	5 1/2	27.3	294.0	L. Head.	Pairs...	L. Side.	Pump...	Cellular.	Dual...	Hand...	Hand...	Schebler...	Gravity.	Spl...	
Marmon 32	4	4 1/2	5	32.4	318.1	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Schebler...	Gravity.	Forced	
Marquette 22-24-25-27	4	5	5	40.4	392.7	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Bosch...	Hand...	Schebler...	Gravity.	Spl...	
Marquette 28	4	5	5 1/2	40.0	412.3	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Splitdorf.	Hand...	Zenith...	Gravity.	Spl...	
Matheson 50	6	4 1/2	5	48.6	477.2	I. Type.	Pairs...	In Head.	Pump...	Cellular.	Double...	Bosch...	Hand...	Stromberg.	Pressure.	Spl...	
Matheson 50	6	4 1/2	5	48.6	477.2	I. Type.	Pairs...	In Head.	Pump...	Cellular.	Double...	Bosch...	Hand...	Stromberg.	Pressure.	Spl...	
Maxwell Messenger	2	4 1/2	4	16.2	127.3	L. Head.	Sep'rate.	Side.	Thermal.	Tubular.	Dual...	Splitdorf.	Hand...	Own...	Gravity.	Spl...	
Maxwell Mascotte	4	4	4	25.6	201.1	T. Head.	Pairs...	Opposite.	Thermal.	Tubular.	Dual...	Splitdorf.	Hand...	Own...	Gravity.	Spl...	
Maxwell Mercury	4	4 1/2	4 1/2	28.9	241.1	T. Head.	Sep'rate.	Opposite.	Thermal.	Tubular.	Dual...	Bosch...	Hand...	Stromberg.	Gravity.	Spl...	
Maxwell Special	4	4 1/2	5 1/2	28.9	297.8	T. Head.	Sep'rate.	Opposite.	Thermal.	Tubular.	Dual...	Splitdorf.	Hand...	Stromberg.	Gravity.	Spl...	
McFarlan 40-45	6	4	5	38.4	377.0	T. Head.	Threes...	Opposite.	Pump...	Cellular.	Dual...	Hand...	Hand...	Hand...	Gravity.	Spl...	
McFarlan 55-60	6	4 1/2	5	43.8	426.4	Head	Threes...	Opposite.	Pump...	Cellular.	Dual...	Hand...	Hand...	Hand...	Gravity.	Spl...	
McIntyre F-12	4	4	5	25.6	251.3	T. Head.	Sep'rate.	Opposite.	Pump...	Tubular.	Dual...	Briggs...	Hand...	Hand...	Gravity.	Spl...	
Mercer 35-R	4	4 1/2	5	30.6	300.7	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Single...	Bosch-2.	Hand...	Schebler...	Pressure.	Spl...	
Mercer 35-A and B	4	4 1/2	5	32.4	318.1	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch-2.	Hand...	Flechter...	Pressure.	Spl...	
Metz 22	4	3 1/2	4	22.5	176.7	L. Head.	Bloc...	Side.	Thermal.	Tubular.	Single...	Bosch...	Fixed...	Holley...	Gravity.	Spl...	
Midland L-3	4	4 1/2	5	32.4	318.1	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Splitdorf.	Hand...	Own...	Gravity.	Spl...	
Midland R	4	4 1/2	5	32.4	318.1	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Splitdorf.	Hand...	Own...	Gravity.	Spl...	
Midland O	6	4.36	5	45.5	450.0	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Mea...	Hand...	Own...	Gravity.	Spl...	
Mitchell 4	4	3 1/2	5 1/2	22.5	242.9	L. Head.	Pairs...	L. Side.	Pump...	Tubular.	Dual...	Splitdorf.	Hand...	Stromberg.	Gravity.	Spl...	
Mitchell 5-4	4	4 1/2	5	28.9	283.6	L. Head.	Pairs...	S. & H.	Pump...	Tubular.	Dual...	Splitdorf.	Hand...	Holley...	Gravity.	Spl...	
Mitchell 5-6 and 2-6	6	3 1/2	5 1/2	33.8	364.3	L. Head.	Pairs...	L. Side.	Pump...	Cellular.	Dual...	Splitdorf.	Hand...	Stromberg.	Gravity.	Spl...	
Mitchell 7-6	6	4 1/2	5	48.6	465.3	L. Head.	Pairs...	Side.	Pump...	Cellular.	Dual...	Splitdorf.	Hand...	Stromberg.	Gravity.	Spl...	
Moline 35 Touring	4	4	6	25.6	301.6	L. Head.	Pairs...	L. Side.	Thermal.	Tubular.	Double...	Splitdorf.	Hand...	Schebler...	Gravity.	Spl...	
Moline 35 Roadster	4	4	6	25.6	301.6	L. Head.	Pairs...	Side.	Thermal.	Tubular.	Double...	Splitdorf.	Hand...	Schebler...	Gravity.	Spl...	
Moon 30	4	4 1/2	5	32.4	318.1	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Remy...	Hand...	Stromberg.	Gravity.	Spl...	
Moon 40	4	4 1/2	5	32.4	318.1	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Remy...	Hand...	Stromberg.	Gravity.	Spl...	
Moon 45	4	4 1/2	5	36.1	354.4	I. Type.	Pairs...	In Head.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Stromberg.	Gravity.	Spl...	
Morse D	4	4 1/2	5	34.3	336.0	I. Type.	Sep'rate.	In Head.	Pump...	Cellular.	Dual...	Eisemann.	Hand...	Hand...	Gravity.	Spl...	
Motorette R*	2	3 1/2	3 1/2	.....	62.2	2-Cycle.	Sep'rate.	.....	Thermal.	Tubular.	Single...	Hand...	Hand...	Own...	Gravity.	In F'l.	
National Roadster	4	5	5 1/2	40.0	446.7	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Splitdorf.	Hand...	Schebler...	Pressure.	Forced	
National Touring	4	5	5 1/2	40.0	446.7	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Bosch...	Hand...	Schebler...	Gravity.	Forced	
New Parry 35	4	4 1/2	4 1/2	28.9	234.0	I. Type.	Pairs...	In Head.	Pump...	Cellular.	Dual...	Optional.	Hand...	Schebler...	Gravity.	Spl...	
Oakland 30	4	4	4	25.6	201.1	L. Head.	Pairs...	L. Side.	Pump...	Tubular.	Dual...	Remy...	Hand...	Schebler...	Gravity.	Spl...	
Oakland 40	4	4 1/2	4 1/2	27.3	253.9	L. Head.	Pairs...	L. Side.	Pump...	Tubular.	Dual...	Remy...	Hand...	Schebler...	Gravity.	Spl...	
Oakland 45	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs...	L. Side.	Pump...	Tubular.	Dual...	Bosch...	Hand...	Schebler...	Gravity.	Spl...	
Octosautof	4	4 1/2	4 1/2	30.6	270.6	L. Head.	Sep'rate.	Side.	Thermal.	Cellular.	Dual...	Hand...	Hand...	Schebler...	Gravity.	Spl...	
Ohio Regular	4	4 1/2	4 1/2	32.4	302.2	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Schebler...	Gravity.	Spl...	
Ohio Speedster	4	4 1/2	4 1/2	39.0	363.8	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Double...	Bosch...	Hand...	Schebler...	Gravity.	Spl...	
Oldsmobile Defender	4	4	6	25.6	301.6	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Own...	Pressure.	Forced	
Oldsmobile Autocrat	4	5	6	40.0	471.2	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Own...	Pressure.	Forced	
Oldsmobile Limited	6	5	6	60.0	706.8	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Own...	Pressure.	Forced	
Only	4	4 1/2	7 1/2	28.9	446.8	T. Head.	Bloc...	Opposite.	Thermal.	Tubular.	Double...	Bosch...	Hand...	Own...	Gravity.	Forced	
Otto	4	4 1/2	4 1/2	28.9	255.3	T. Head.	Pairs...	Opposite.	Pump...	Cellular.	Dual...	Bosch...	Hand...	Stromberg.	Gravity.	Splash	

ABBREVIATIONS: S. & H., side and head; R., right; L., left; Thermal, thermo-syphon water circulation; Spl., splash; In F'l., in fuel; Ell., elliptical; Plat., platinum; Spec., special; I-b-m, I-beam; M. Disc, multiple disc; E., B'd, expanding band; C. B'd, contracting band; Exp., expanding; C. & D., cone and disc; D. Pl., dry plate; A. & I., asbestos and iron; A. & S., asbestos and steel; C. I., cast iron; B. & S., bronze and steel; C. & B., cork and bronze; C. & S., cork and steel; F. & S., fibre and steel; F. & I., fibre and iron; Fa. & S., fabric and steel; I. & C., iron and cork; L. & I., leather and iron; L. & S., leather and steel; L. & C., leather and cork; L. & A., leather and as-

## the Market for the Season of 1912 — Continued

Wheelbase	RUNNING GEAR					TRANSMISSION										BEARINGS							
	TIRES		SPRINGS		Front Axle	CLUTCH		GEARSET			Drive	Car Drives Through	Rear Axle	BRAKES		CRANK SHAFT		Gear-set	Front Wheel	Rear Axle	Steer Knuckle	Steering Gear	
	Fr.	Rear	Fr.	Rear		Type	Fric. Surf.	Type	No.	Location				Ser.	Em.	Type	No.						
117	34x4	34x4	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	U. Mo.	Shaft.	Springs.	Floating.	Ext.	Int.	Plain.	5	Ball.	Roll.	Roll.	Plain	Plain	
122	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	Amid.	Shaft.	Springs.	Floating.	Ext.	Int.	Plain.	5	Ball.	Roll.	Roll.	Plain	Plain	
116	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	R. & I.	Select.	3	U. Mo.	Shaft.	Tor. Rod.	Floating.	Int.	Int.	Plain.	3	Roll.	Ball.	Ball.	Plain	B&P	
120	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	Leath'r.	Select.	4	Amid.	Shaft.	Tor. Tube.	Floating.	Ext.	Int.	Plain.	5	Ball.	Roll.	Ball.	Plain	Plain	
135	36x4	37x5	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	4	Amid.	Shaft.	Tor. Tube.	Floating.	Ext.	Int.	Plain.	7	Ball.	Roll.	Roll.	Plain	Roll	
124	36x4	36x5	Ell.	Plat.	I-b'm.	M. Disc	Steel.	Select.	4	Amid.	Shaft.	Rad. Rd.	Floating.	Ext.	Int.	Ball.	3	Ball.	Ball.	Ball.	B&P	B&P	
131	36x4	36x5	Ell.	Plat.	I-b'm.	M. Disc	Steel.	Select.	4	Amid.	Shaft.	Rad. Rd.	Floating.	Ext.	Int.	Ball.	4	Ball.	Ball.	Ball.	B&P	B&P	
124	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	4	Amid.	Shaft.		Floating.			Plain.	3	Roll.	Ball.	B&R	Ball.	Ball	
128	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	4	Amid.	Shaft.		Floating.			Plain.	5	Roll.	Ball.	B&R	Ball.	Ball	
90			Ell.	Ell.	I-b'm.	M. Disc	Steel.	Prog.	2	U. Mo.	Shaft.		Semi-float'g.	Ext.	Int.	Plain.	3	Ball.	Ball.	Roll.	Ball.	Ball	
96			Ell.	Ell.	I-b'm.	M. Disc	Steel.	Prog.	2	U. Mo.	Shaft.		Semi-float'g.	Ext.	Int.	Plain.	3	Ball.	Ball.	Roll.	Ball.	Ball	
116	34x3	34x3	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	U. Mo.	Shaft.		Semi-float'g.	Ext.	Int.	Plain.	3	Ball.	Ball.	Roll.	Ball.	Ball	
118	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	U. Mo.	Shaft.		Semi-float'g.	Ext.	Int.	Plain.	3	Ball.	Ball.	Roll.	Ball.	Ball	
120	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	U. Mo.	Shaft.		Floating.	Ext.	Int.	Plain.	3	Ball.	Ball.	Roll.	Ball.	Ball	
121	37x4	37x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	U. Mo.	Shaft.		Floating.	Ext.	Int.	Plain.	3	Ball.	Ball.	Roll.	Ball.	Ball	
111	32x4	32x4	Ell.	Ell.	I-b'm.	Cone.	A. & I.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Semi-float'g.	Int.	Int.	Plain.	5	Ball.	Ball.	Roll.	Plain	Ball	
111	34x4	34x4	Ell.	Ell.	I-b'm.	Cone.	A. & I.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Semi-float'g.	Int.	Int.	Plain.	3	Ball.	Ball.	Roll.	Plain	Ball	
120	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	A. & Z.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Floating.	Int.	Int.	Plain.	3	Ball.	Roll.	Roll.	Plain	Ball	
120	35x4	35x4	Ell.	Ell.	I-b'm.	Cone.	Therm.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Floating.	Int.	Int.	Plain.	3	Ball.	Roll.	B&R	Ball.	Plain	
122	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	Amid.	Shaft.		Floating.	Ext.	Int.	Plain.	3	Ball.	Ball.	Ball.	Plain	Plain	
119	36x4	36x4	Ell.	Plat.	I-b'm.	Cone.	Leath'r.	Select.	4	Amid.	Shaft.	Rad. Rd.	Floating.	Ext.	Int.	Plain.	3	Ball.	Ball.	Ball.	Plain	Plain	
125	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	4	Ball.	Roll.	Ball.	Roll.	Ball	
135	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	4	Ball.	Roll.	Ball.	Roll.	Ball	
86	28x3	28x3	Ell.	Ell.	Tube.	M. Disc	S. & B.	Plan.	2	U. Mo.	Shaft.	Tor. Rod.	Semi-float'g.	Ext.	Tran.	Plain.	2	Plain	Ball.	Roll.	Plain	Plain	
104	32x3	32x3	Ell.	Ell.	Tube.	M. Disc	Steel.	Select.	3	U. Mo.	Shaft.	Springs.	Semi-float'g.	Ext.	Int.	Plain.	3	P&R	Ball.	B&R	Plain	Plain	
110	34x4	34x4	Ell.	Ell.	Tube.	M. Disc	Steel.	Select.	3	U. Mo.	Shaft.	Springs.	Semi-float'g.	Ext.	Int.	Plain.	5	P&R	Ball.	Roll.	Plain	Plain	
114	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	U. Mo.	Shaft.	Springs.	Floating.	Ext.	Int.	Plain.	5	P&R	Roll.	Roll.	Plain	Plain	
124	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	R. Ax.	Shaft.			Int.	Int.	Plain.	3						
128	37x4	37x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	U. Mo.	Shaft.			Int.	Ext.	Plain.	5						
114	34x3	34x3	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Semi-float'g.	Int.	Ext.	Plain.	3	Roll.	Ball.	Roll.	Plain	Plain	
108	32x4	32x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	Amid.	Shaft.	Rad. Rd.	Floating.	Tran.	Int.	Plain.	3	Ball.	Ball.	Ball.	Ball.	Ball	
118	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	4	Amid.	Shaft.	Rad. Rd.	Floating.	Tran.	Int.	Plain.	3	Ball.	Ball.	Ball.	Ball.	Ball	
90	30x3	30x3	Ell.	Ell.	Tube.			Fric.	5	Amid.	Chain.	Rad. Rd.	Dead.	Disc.		Plain.	3		Ball.	Ball.	Plain	Plain	
115	34x4	34x4	Ell.	Ell.	Channel	M. Disc	Raybes.	Select.	3	U. Mo.	Shaft.	Tor. Tube.	Floating.	Int.	Int.	Plain.	3	Roll.	Ball.	Ball.	Plain	B&P	
118	35x4	35x4	Ell.	Ell.	I-b'm.	M. Disc	Raybes.	Select.	3	U. Mo.	Shaft.	Tor. Tube.	Floating.	Int.	Int.	Plain.	3	Roll.	Roll.	Ball.	Plain	B&P	
118	35x4	35x4	Ell.	Ell.	I-b'm.	M. Disc	Raybes.	Select.	3	U. Mo.	Shaft.	Tor. Tube.	Floating.	Int.	Int.	Plain.	3	Roll.	Roll.	Ball.	Plain	Roll.	
100	32x3	32x3	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	3	Roll.	Ball.	Ball.	Plain	Plain	
112	34x4	34x4	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	Amid.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	3	Ball.	Ball.	Roll.	Ball.	Ball	
125	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	Amid.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	4	Roll.	Ball.	Ball.	Ball.	Plain	
135	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	Amid.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	5	Roll.	Ball.	Ball.	Ball.	Plain	
114	37x4	37x4	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	U. Mo.	Shaft.	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain.	3	Roll.	Ball.	Roll.	Plain	Plain	
114	36x3	36x3	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	U. Mo.	Shaft.	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain.	3	Roll.	Ball.	Roll.	Plain	Plain	
115	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	R. Ax.	Shaft.	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain.	3	Roll.	Ball.	B&R	Plain	Plain	
120	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	3	Amid.	Shaft.	Springs.	Floating.	Ext.	Int.	Plain.	3	Ball.	Roll.	B&R	Plain	Plain	
123	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	4	Amid.	Shaft.	Springs.	Floating.	Ext.	Int.	Plain.	3	Plain	Roll.	Ball.	Plain	Plain	
127	36x4	37x5	Ell.	Ell.	I-b'm.	M. Disc	Steel.	Select.	4	Amid.	Shaft.	Tor. Tube.	Semi-float'g.	Int.	Int.	Plain.	5	Ball.	Ball.	Ball.	B&P	Ball	
74	28x3	29x3	Ell.	Spec.		Cone.	Leath'r.	Plan.	2	U. Mo.	Chain.	Springs.	Dead.	Int.	Tran.	Plain.	2	Plain	Ball.	Ball.	Plain	B&P	
124	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	L. & I.	Select.	3	Amid.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	3	Ball.	Roll.	Roll.	Plain	Plain	
124	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	L. & I.	Select.	3	Amid.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	3	Ball.	Roll.	Roll.	Plain	Plain	
116	32x00	34x00	Ell.	Ell.	I-b'm.	Cone.	L. & S.	Select.	3	Amid.	Shaft.	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain.	3	Roll.	Ball.	Roll.	Ball.	Plain	
106	34x3	34x3	Ell.	Ell.	I-b'm.	Cone.	L. & I.	Select.	3	U. Mo.	Shaft.	Springs.	Semi-float'g.	Ext.	Int.	Plain.	3	Ball.	Ball.	Roll.	Plain	Ball	
112	34x4	34x4	Ell.	Ell.	I-b'm.	Cone.	L. & I.	Select.	3	U. Mo.	Shaft.	Springs.	Semi-float'g.	Ext.	Int.	Plain.	3	Ball.	Ball.	Roll.	Plain	Ball	
120	36x4	35x4	Ell.	Ell.	I-b'm.	Cone.	L. & I.	Select.	3	U. Mo.	Shaft.	Springs.	Floating.	Ext.	Int.	Plain.	3	Ball.	Ball.	Ball.	Ball.	Ball	
175	34x3	34x4			I-b'm.	Cone.	L. & I.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Floating.			Plain.	5	Ball.	Roll.	Roll.	Plain	Plain	
115	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	S. & B.	Select.	3	U. Mo.	Shaft.	S. & T. R.	Floating.	Ext.	Int.	Plain.	4	Ball.	Roll.	Ball.	Ball.	Plain	
105	32x4	32x4	Ell.	Ell.	I-b'm.	M. Disc	S. & B.	Select.	3	U. Mo.	Shaft.	S. & T. R.	Floating.	Ext.	Int.	Plain.	4	Ball.	Roll.	Ball.	Ball.	Plain	
116	36x4	36x4	Ell.	Ell.	I-b'm.	Cone.	T. & I.	Select.	4	Amid.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	3	Ball.	Roll.	Ball.	Roll.	Ball	
126	38x4	39x5	Ell.	Ell.	I-b'm.	Cone.	T. & I.	Select.	4	Amid.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	3	Ball.	Roll.	Ball.	Roll.	Ball	
140	42x4	43x5	Ell.	Ell.	I-b'm.	Cone.	T. & I.	Select.	4	Amid.	Shaft.	Tor. Tube.	Floating.	Int.	Ext.	Plain.	4	Ball.	Roll.	Ball.	Roll.	Ball	
112	31x4	31x4	Ell.		I-b'm.	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Semi-float'g.	Int.	Ext.	Ball.	4	Ball.	Ball.	Ball.	Ball.	Ball	
123	34x3	34x3	Ell.	Ell.	I-b'm.	Cone.	Leath'r.	Select.	3	R. Ax.	Shaft.	Tor. Tube.	Floating.	Ext.	Int.	Plain.	3		Ball.	Ball.			

bestos; R. & I., raybestos and iron; S. & B., steel and bronze; S. & R., steel and raybestos; S. & C., steel and cork; T. & I., thermoid and iron; U. Mo., unit motion; Amid., amidship; T. T. & R. R., torsion tube and radius rod; T. T. & S., torsion tube and spring; T. T. & R., torsion tube and rod; R. R. & S., radius rod and spring; T. & R. R., torsion and radius rod; S. & T. R., spring and torsion rod; I. & E., internal and external; B. & P., ball and plain; B. & R., ball and roller; P. & R., plain and roller. \*Motorette has three wheels. †Octauto has eight wheels.

Table of Specifications of American Chassis on

NAME AND MODEL	MOTOR																Motor Lubrication
	No. of Cylinders	Bore	Stroke	H.P. S.A.E.	Piston Displacement	Cylinder Type	Cylinder How Cast	Valve Location	COOLING		IGNITION			CARBURETION			
									Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed		
Overland 55	4	3 1/2	4 1/2	22.5	198.8	L. Head.	Sep'rate.	L. Side	Thermal.	Tubular.	Dual	Splitdorf	Hand	Schebler	Gravity	Forced	
Overland 59	4	4 1/2	4 1/2	25.6	226.2	L. Head.	Sep'rate.	L. Side	Thermal.	Tubular.	Dual	Splitdorf	Hand	Schebler	Gravity	Forced	
Overland 60	4	4 1/2	4 1/2	27.3	240.5	L. Head.	Sep'rate.	L. Side	Thermal.	Tubular.	Dual	Remy	Hand	Schebler	Gravity	Spl	
Overland 61	4	4 1/2	4 1/2	30.6	270.6	L. Head.	Sep'rate.	L. Side	Thermal.	Tubular.	Dual	Bosch	Hand	Schebler	Gravity	Spl	
Packard 18 Runabout	4	4 1/2	5 1/2	26.4	265.7	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Eisemann	Hand	Own	Pressure	Spl	
Packard 18 Standard	4	4 1/2	5 1/2	26.4	265.7	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Eisemann	Hand	Own	Gravity	Spl	
Packard 30 Runabout	4	5	6	40.0	471.2	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Eisemann	Hand	Own	Pressure	Spl	
Packard 30 Standard	4	5	6	40.0	471.2	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Eisemann	Hand	Own	Gravity	Spl	
Packard 30 Phaeton	4	5	6	40.0	471.2	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Eisemann	Hand	Own	Pressure	Spl	
Packard 6 Runabout	6	4 1/2	5 1/2	48.6	424.9	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Bosch	Hand	Own	Pressure	Forced	
Packard 6 Standard	6	4 1/2	5 1/2	48.6	424.9	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Bosch	Hand	Own	Gravity	Forced	
Packard 6 Phaeton	6	4 1/2	5 1/2	48.6	424.9	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Bosch	Hand	Own	Pressure	Forced	
Paige Beverly	4	3 1/2	4	22.5	176.7	L. Head.	Bloc	L. Side	Thermal	Cellular	Single	Bosch	Fixed	Meyer	Gravity	Spl	
Palmer-Singer 6-40	6	4	5	38.4	377.0	T. Head.	Threes	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Pressure	Spl	
Palmer-Singer 46	6	4	5	38.4	377.0	T. Head.	Threes	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Pressure	Spl	
Palmer-Singer 6-60	6	4 1/2	5 1/2	57.0	615.9	T. Head.	Pairs	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Pressure	Spl	
Paterson 35	4	4	5 1/2	25.6	201.1	L. Head.	Pairs	L. Side	Pump	Cellular	Dual	Bosch	Hand	Schebler	Gravity	Spl	
Paterson 45	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs	L. Side	Pump	Cellular	Dual	Bosch	Hand	Schebler	Gravity	Spl	
Pathfinder 40	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Bloc	Side	Thermal	Cellular	Dual	Optional	Hand	Schebler	Gravity	Spl	
Peerless D	4	4	4 1/2	25.6	232.5	L. Head.	Pairs	L. Side	Pump	Tubular	Dual	Bosch	Hand	Own	Gravity	Spl	
Peerless J	6	4	5 1/2	38.4	414.8	T. Head.	Pairs	Opposite	Pump	Tubular	Double	Bosch	Hand	Own	Gravity	Spl	
Peerless H	4	5	5 1/2	40.0	431.9	T. Head.	Pairs	Opposite	Pump	Tubular	Double	Bosch	Hand	Own	Gravity	Spl	
Peerless K	6	4 1/2	6	48.6	572.6	T. Head.	Pairs	Opposite	Pump	Tubular	Double	Bosch	Hand	Own	Gravity	Spl	
Peerless L	6	5	7	60.0	824.8	T. Head.	Pairs	Opposite	Pump	Tubular	Double	Bosch	Hand	Own	Gravity	Spl	
Penn RF and T4	4	3 1/2	4 1/2	22.5	198.8	L. Head.	Bloc	R. Side	Thermal	Tubular	Dual	Briggs	Hand	Schebler	Gravity	Spl	
Penn TR-T5	4	4 1/2	5 1/2	27.3	294.0	L. Head.	Bloc	R. Side	Thermal	Tubular	Dual	Briggs	Hand	Schebler	Gravity	Spl	
Petrol 25 and 35	4	3 1/2	4 1/2	22.5	198.8	L. Head.	Pairs	L. Side	Pump	Tubular	Dual	S-X	Hand	Stromberg	Gravity	Spl	
Petrol 45-55-65-75	4	4 1/2	4 1/2	30.6	285.6	L. Head.	Pairs	L. Side	Pump	Tubular	Dual	Remy	Hand	Stromberg	Gravity	Spl	
Pickard	4	4	4	25.6	201.1	T. Head.	Sep'rate	Opposite	Air		Single	K-W	Hand	Breeze	Gravity	Spl	
Pierce-Arrow 36-R	6	4	5 1/2	38.4	386.4	T. Head.	Pairs	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Gravity	Spl	
Pierce-Arrow 36-T	6	4	5 1/2	38.4	386.4	T. Head.	Pairs	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Gravity	Spl	
Pierce-Arrow 48-R	6	4 1/2	5 1/2	48.6	424.9	T. Head.	Pairs	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Gravity	Spl	
Pierce-Arrow 48-T	6	4 1/2	5 1/2	48.6	424.8	T. Head.	Pairs	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Gravity	Spl	
Pierce-Arrow 66-R	6	5	7	60.0	829.9	T. Head.	Pairs	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Gravity	Spl	
Pierce-Arrow 66-T	6	5	7	60.0	829.9	T. Head.	Pairs	Opposite	Pump	Cellular	Double	Bosch	Hand	Own	Gravity	Spl	
Pilot 40	4	4 1/2	5	32.4	318.1	T. Head.	Bloc	Opposite	Pump	Cellular	Single	Splitdorf	Hand	Schebler	Gravity	Spl	
Pope-Hartford 27	4	4 1/2	5 1/2	36.1	389.9	I. Type	Pairs	In Head	Pump	Tubular	Dual	Bosch	Hand	Own	Gravity	Spl	
Pope-Hartford 28	6	4 1/2	5 1/2	44.6	471.0	I. Type	Pairs	In Head	Pump	Tubular	Dual	Bosch	Hand	Own	Gravity	Spl	
Pratt 40	4	4 1/2	4 1/2	32.4	302.2	L. Head.	Pairs	L. Side	Pump	Cellular	Dual	Bosch	Hand	Schebler	Gravity	Spl	
Premier M-4	4	4 1/2	5 1/2	32.4	334.0	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Eisemann	Gov'nor	Schebler	Gravity	Spl	
Premier M-6	6	4 1/2	5 1/2	48.6	501.0	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Eisemann	Gov'nor	Carter	Gravity	Spl	
Pullman 4-30	4	4 1/2	5	26.4	259.2	T. Head.	Pairs	Opposite	Pump	Tubular	Dual	Bosch	Hand	Stromberg	Gravity	Spl	
Pullman 4-40	4	4 1/2	5 1/2	32.4	349.9	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Bosch	Hand	Stromberg	Gravity	Spl	
Pullman 6-60	6	4 1/2	5 1/2	48.6	424.9	T. Head.	Pairs	Opposite	Pump	Cellular	Dual	Bosch	Hand	Stromberg	Gravity	Spl	
Rambler Cross Country	4	4 1/2	4 1/2	32.4	286.3	L. Head.	Sep'rate	R. Side	Pump	Tubular	Dual	Bosch	Hand	Holley	Gravity	Spl	
Rambler Country Club	4	5	5 1/2	40.0	431.9	L. Head.	Sep'rate	R. Side	Pump	Tubular	Dual	Bosch	Hand	Stromberg	Gravity	Spl	
Rambler Moraine	4	5	5 1/2	40.0	431.9	L. Head.	Sep'rate	R. Side	Pump	Tubular	Dual	Bosch	Hand	Stromberg	Gravity	Spl	
Rambler Metropolitan	4	5	5 1/2	40.0	431.9	L. Head.	Sep'rate	R. Side	Pump	Tubular	Dual	Bosch	Hand	Holley	Gravity	Spl	
Rayfield C	6	3 1/2	5	37.2	299.0	T. Head.	Pairs	Opposite	Thermal	Cellular	Single	Optional	Hand	Own	Gravity	Spl	
R. C. H. Runabout	4	3 1/2	5	16.9	165.9	L. Head.	Bloc	L. Side	Thermal	Tubular	Single	Bosch	Fixed	Breeze	Gravity	Spl	
R. C. H. Touring	4	3 1/2	5	16.9	165.9	L. Head.	Bloc	L. Side	Thermal	Tubular	Single	Bosch	Fixed	Breeze	Gravity	Spl	
Reading 40	4	5	6	40.0	471.2	T. Head.	Bloc	Opposite	Pump	Tubular	Double	Pittsfield	Hand	Flechter	Gravity	Spl	
Regal N	4	3 1/2	4 1/2	22.5	198.8	L. Head.	Bloc	L. Side	Thermal	Tubular	Dual	Michigan	Hand	Schebler	Gravity	Spl	
Regal L	4	4 1/2	4	27.3	213.8	L. Head.	Pairs	L. Side	Thermal	Tubular	Dual	Michigan	Hand	Schebler	Gravity	Spl	
Regal H	4	4 1/2	4 1/2	28.9	255.3	L. Head.	Pairs	L. Side	Thermal	Tubular	Dual	Michigan	Hand	Kingston	Gravity	Spl	
Reo the Fifth	4	4	4 1/2	25.6	226.2	L. Head.	Pairs	In Head	Pump	Tubular	Single	National	Hand	Holley	Gravity		
Republic 111-112-113	4	4 1/2	5	28.9	283.6	T. Head.	Pairs	Opposite	Pump	Tubular	Double	Bosch	Hand	Stromberg	Gravity	Spl	
Richmond N	4	4	4 1/2	25.6	226.2		Sep'rate		Thermal	Cellular	Dual	S-X		Kingston	Gravity	Spl	
Richmond M	4	4 1/2	5	32.4	318.1		Sep'rate		Pump	Cellular	Dual	S-X		Kingston	Gravity	Spl	
Ritter 1912	4	3 1/2	3 1/2	16.9	112.0	L. Head.	Pairs	Side	Thermal	Tubular	Dual	Remy	Hand		Gravity	Spl	
Roadster 20	4	3 1/2	4 1/2	15.6	130.4	L. Head.	Bloc	R. Side	Thermal	Cellular	Single	Bosch	Fixed	Own	Gravity	Spl	

ABBREVIATIONS: S. & H., side and head; R., right; L., left; Thermal, thermo-siphon water circulation; Spl., splash; In F.I. in fuel; Ell., elliptical; Plat., platinum; Spec., special; I-b.m., I-beam; M.Disc, multiple disc; E. B'd, expanding band; C. B'd, contracting band; Exp., expanding; C. & D., cone and disc; D. Pl., dry plate; A. & I., asbestos and iron; A. & S., asbestos and steel; C. I., cast iron; B. & S., bronze and steel; C. & B., cork and bronze; C. & S., cork and steel; F. & S., fibre and steel; F. & I., fibre and iron; F. & S., fabric and steel; I. & C., iron and cork; L. & I., leather and iron; L. & S., leather and steel; L. & C., leather and cork; L. & A., leather and as-

## the Market for the Season of 1912 — Continued

Wheelbase	RUNNING GEAR					TRANSMISSION										BEARINGS						
	TIRES		SPRINGS		Front Axle	CLUTCH		GEARSET			Drive	Car Drives Through	Rear Axle	BRAKES		CRANK-SHAFT		Gear-set	Front Wheel	Rear Axle	Steer Knuckle	Steering Gear
	Fr.	Rear	Fr.	Rear		Type	Fric. Surf.	Type	No.	Location				Ser.	Em.	Type	No.					
96	32x3	32x3	Ell.	Ell.	I-b'm...	M.Disc	A. & I.	Plan.	2	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Int...	Ext...	Plain...	5	Ball...	Roll...	Roll...	Plain	B&P.
106	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	A. & I.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Int...	Ext...	Plain...	5	Ball...	Roll...	Roll...	Plain	B&P.
114	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	A. & I.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Int...	Ext...	Plain...	5	Ball...	Roll...	Roll...	Plain	B&P.
118	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	A. & I.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Floating...	Int...	Ext...	Plain...	5	Ball...	Roll...	Roll...	Plain	B&P.
108	34x4	34x4	Ell.	Ell.	Tube...	M.Disc	F. & S.	Prog.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	Ball...	Roll...	Ball...	Plain	Plain
112	34x4	34x4	Ell.	Ell.	Tube...	M.Disc	F. & S.	Prog.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	Ball...	Roll...	Ball...	Plain	Plain
114	36x4	37x5	Ell.	Ell.	Tube...	M.Disc	F. & S.	Prog.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	Ball...	Roll...	Ball...	Plain	Plain
123	36x4	37x5	Ell.	Ell.	Tube...	M.Disc	F. & S.	Prog.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	Ball...	Roll...	Ball...	Plain	Plain
129	36x4	37x5	Ell.	Ell.	Tube...	M.Disc	F. & S.	Prog.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	3	Ball...	Roll...	Ball...	Plain	Plain
121	36x4	37x5	Ell.	Ell.	Tube...	M.Disc	F. & S.	Prog.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	4	Ball...	Roll...	Ball...	Plain	Plain
133	36x4	37x5	Ell.	Ell.	Tube...	M.Disc	F. & S.	Prog.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	4	Ball...	Roll...	Ball...	Plain	Plain
139	36x4	37x5	Ell.	Ell.	Tube...	M.Disc	F. & S.	Prog.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Ext...	Int...	Plain...	4	Ball...	Roll...	Ball...	Plain	Plain
104	32x3	32x3	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	3	U. Mo.	Shaft...	Tor. Tube.	Semi-float'g.	Int...	Ext...	Plain...	2	B&R	Ball...	B&R	Plain	Plain
126	34x4	34x4	Ell.	Ell.	I-b'm...	M.Disc	S. & R.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Int...	Ext...	Plain...	3	Ball...	Roll...	B&R	Plain	Plain
126	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	4	R. Ax.	Shaft...	Rad. Rd.	Floating...	Int...	Ext...	Plain...	3	Ball...	Roll...	Roll...	Plain	Plain
138	36x4	36x5	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Int...	Ext...	Plain...	4	Ball...	Roll...	Roll...	Plain	Plain
108	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	U. Mo.	Shaft...	T. T. & R. R.	Semi-float'g.	Ext...	Int...	Plain...	3	Ball...	Roll...	Roll...	Plain	Ball.
120	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	U. Mo.	Shaft...	T. T. & R. R.	Floating...	Ext...	Int...	Plain...	3	Ball...	Roll...	Roll...	Plain	Ball.
118	34x00	34x00	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	U. Mo.	Shaft...	Tor. Tube.	Floating...	Int...	Ext...	Plain...	3	Ball...	Roll...	Roll...	Plain	Plain
113	34x4	34x4	Ell.	Ell.	I-b'm...	Exp...	L. & A.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	3	Ball...	Roll...	Roll...	Ball...	Ball.
125	36x4	36x4	Ell.	Ell.	I-b'm...	Exp...	L. & A.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	7	Ball...	Roll...	Roll...	Ball...	Ball.
124	36x4	37x5	Ell.	Ell.	I-b'm...	Exp...	L. & A.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	3	Ball...	Roll...	Roll...	Ball...	Ball.
137	36x4	37x5	Ell.	Ell.	I-b'm...	Exp...	L. & A.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	7	Ball...	Roll...	Roll...	Ball...	Ball.
140	37x5	38x5	Ell.	Ell.	I-b'm...	Exp...	L. & A.	Select.	4	Amid...	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	7	Ball...	Roll...	Roll...	Ball...	Ball.
105	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	2	Plain	Ball...	Roll...	Ball...	Ball.
115	34x3	34x3	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	2	Ball...	Ball...	Roll...	Roll...	Ball.
98	32x3	33x3	Ell.	Ell.	I-b'm...	.....	.....	Fric...	.....	Amid...	Chain...	Rad. Rd.	Dead.....	Int...	Ext...	Plain...	3	Plain	Ball...	Ball...	Plain	Plain
115	34x3	34x3	Ell.	Ell.	I-b'm...	.....	.....	Fric...	.....	Amid...	Chain...	Rad. Rd.	Dead.....	Int...	Ext...	Plain...	3	Plain	Ball...	Ball...	Plain	Plain
104	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	Tor. Tube.	Semi-float'g.	Int...	Ext...	Plain...	3	Plain	Ball...	Ball...	Plain	Plain
119	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	4	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	Plain...	7	Ball...	Roll...	B&R	Plain	B&P.
127	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	4	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	Plain...	7	Ball...	Roll...	B&R	Plain	B&P.
128	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	4	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	Plain...	7	Ball...	Roll...	B&R	Plain	B&P.
134	37x5	37x5	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	4	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	Plain...	7	Ball...	Roll...	B&R	Plain	B&P.
133	37x5	37x5	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	4	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	Plain...	7	Ball...	Roll...	B&R	Plain	B&P.
140	37x5	38x5	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	4	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	Plain...	7	Ball...	Roll...	B&R	Plain	B&P.
120	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	3	U. Mo.	Shaft...	.....	Semi-float'g.	Int...	Ext...	Plain...	3	Ball...	Ball...	Ball...	Ball...	Plain
124	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	4	Amid...	Shaft...	T. & R. R.	Floating...	Ext...	Int...	Plain...	3	Plain	Roll...	P&R	Roll...	Roll.
134	38x4	39x5	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	4	Amid...	Shaft...	T. & R. R.	Floating...	Ext...	Int...	Plain...	3	Plain	Roll...	P&R	Roll...	Roll.
120	36x4	36x4	Ell.	Ell.	Channel	Cone...	A. & S.	Select.	3	U. Mo.	Shaft...	T. T. & R. R.	Floating...	Int...	Ext...	Plain...	3	B&R	Ball...	Ball...	Plain	Plain
126	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	S. & C.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	Plain...	3	Ball...	Roll...	B&R	B&P	Roll.
140	36x4	36x4	Ell.	Ell.	I-b'm...	M.Disc	S. & C.	Select.	3	Amid...	Shaft...	Springs...	Semi-float'g.	Int...	Ext...	Plain...	5	Ball...	Roll...	B&R	B&P	Roll.
118	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Tor. Tube.	Floating...	Ext...	Int...	Plain...	3	Ball...	Ball...	Ball...	Plain	B&P.
122	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	4	Amid...	Shaft...	Tor. Tube.	Floating...	Ext...	Int...	Plain...	3	Ball...	Ball...	Ball...	Plain	B&P.
136	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	4	Amid...	Shaft...	Tor. Tube.	Floating...	Ext...	Int...	Plain...	4	Ball...	Ball...	Ball...	Plain	B&P.
120	36x4	36x4	Ell.	Ell.	I-b'm...	Exp...	L. & I.	Select.	3	Amid...	Shaft...	T. T. & R. R.	Semi-float'g.	Ext...	Int...	Plain...	3	Roll...	Roll...	Roll...	Roll...	Ball.
120	36x4	36x4	Ell.	Ell.	Tube...	Exp...	L. & I.	Select.	3	Amid...	Shaft...	T. T. & R. R.	Semi-float'g.	Ext...	Int...	Plain...	3	Roll...	Roll...	Roll...	Roll...	Ball.
128	40x4	40x4	Ell.	Ell.	Tube...	Exp...	L. & I.	Select.	3	Amid...	Shaft...	T. T. & R. R.	Semi-float'g.	Ext...	Int...	Plain...	3	Roll...	Roll...	Roll...	Roll...	Ball.
128	40x4	40x4	Ell.	Ell.	I-b'm...	Exp...	L. & I.	Select.	3	Amid...	Shaft...	T. T. & R. R.	Semi-float'g.	Ext...	Int...	Plain...	3	Roll...	Roll...	Roll...	Roll...	Ball.
117	34x00	34x00	Ell.	Ell.	I-b'm...	M.Disc	S. & R.	Select.	3	U. Mo.	Shaft...	Rad. Rd.	Floating...	Ext...	Int...	Plain...	4	Ball...	Ball...	Ball...	Ball...	Plain
86	30x3	30x3	Ell.	Ell.	I-b'm...	Cone...	A. & I.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	2	P&R	Ball...	B&R	Plain	Plain
110	31x3	31x3	Ell.	Ell.	I-b'm...	Cone...	A. & I.	Select.	3	R. Ax.	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	2	P&R	Ball...	B&R	Plain	Plain
122	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	Amid...	Shaft...	Tor. Rd.	Floating...	Ext...	Int...	Plain...	5	Plain	Roll...	Roll...	Plain	Plain
100	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	L. & I.	Select.	3	R. Ax.	Shaft...	Tor. T.	Semi-float'g.	Int...	Ext...	Plain...	2	Roll...	Ball...	Roll...	Plain	Plain
109	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Int...	Ext...	Plain...	3	Roll...	Ball...	Roll...	Plain	Plain
118	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	.....	Select.	3	R. Ax.	Shaft...	Rad. Rd.	Semi-float'g.	Int...	Ext...	Plain...	3	Roll...	Ball...	Roll...	Plain	Plain
112	34x3	34x3	Ell.	Ell.	I-b'm...	M.Disc	A. & S.	Select.	3	Amid...	Shaft...	Tor. Tube.	Semi-float'g.	Ext...	Int...	Plain...	3	Roll...	Roll...	Roll...	Plain	Plain
120	36x4	36x4	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	R. Ax.	Shaft...	Rad. Rd.	Floating...	Int...	Ext...	Plain...	3	Ball...	Ball...	Ball...	Ball...	Plain
106	32x3	32x3	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	.....	Semi-float'g.	Int...	Ext...	Plain...	5	Ball...	Roll...	Ball...	Ball...	Plain
112	34x4	34x4	Ell.	Ell.	I-b'm...	Cone...	Leath'r.	Select.	3	Amid...	Shaft...	.....	Semi-float'g.	Int...	Ext...	Plain...	5	Ball...	Roll...	Ball...	.....	Plain
90	30x3	30x3	Ell.	Ell.	I-b'm...	M.Disc	Steel...	Select.	2	U. Mo.	Shaft...	Tor. Tube.	Semi-float'g.	Int...	Ext...	Plain...	3	.....	.....	.....	.....	.....
105	30x3	00x3	Ell.	Ell.	Tube...	Cone...	Steel...	Select.	2	R. Ax.	Shaft...	.....	Semi-float'g.	Ext...	Int...	Plain...	2	.....	.....	Ball...	.....	.....

bestos; R. & I., raybestos and iron; S. & B., steel and bronze; S. & R., steel and raybestos; S. & C., steel and cork; T. & I., thermoid and iron; U. Mo., unit motion; Amid., amidship; T. T. & R. R., torsion tube and radius rod; T. T. & S., torsion tube and spring; T. T. & R., torsion tube and rod; R. R. & S., radius rod and spring; T. & R. R., torsion and radius rod; S. & T. R., spring and torsion rod; I. & E., internal and external; B. & P., ball and plain; B. & R., ball and roller; P. & R., plain and roller.

## Table of Specifications of American Chassis on

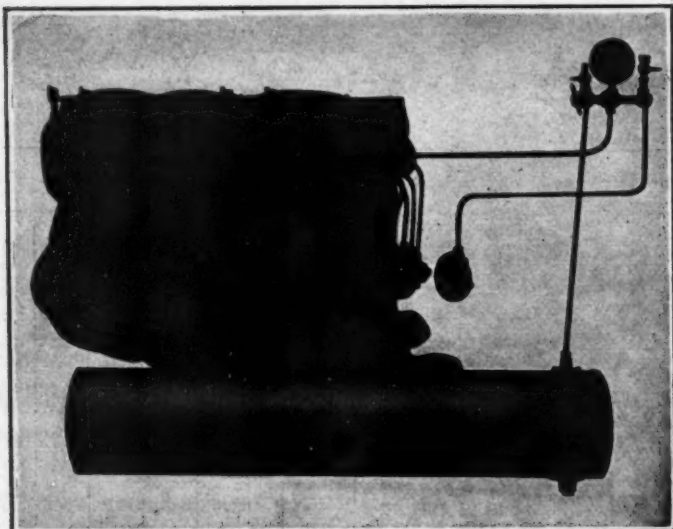
NAME AND MODEL	MOTOR															
	No. of Cylinders	Bore	Stroke	H.P., S.A.E.	Piston Displacement	Cylinder Type	Cylinder How Cast	Valve Location	COOLING		IGNITION			CARBURETION		Motor Lubrication
									Circulation	Radiator	System	Magneto	Control	Design	Fuel Feed	
Rogers C.	2	4 1/2	4	18.0	141.8	L. Head.	Sep'rate.	Side.....	Air.....	.....	Single.....	.....	Fixed.....	Kingston.....	Gravity.....	Spl.....
Schacht B.	2	5 1/2	4 1/2	21.0	185.7	L. Head.	Bloc.....	R. Side.....	Thermal..	Cellular..	Single.....	Splitdorf..	Hand.....	Schebler.....	Gravity.....	Spl.....
Schacht G-F.	4	4 1/2	5	29.2	292.1	L. Head.	Bloc.....	R. Side.....	Pump.....	Cellular..	Single.....	.....	Hand.....	Schebler.....	Gravity.....	Spl.....
Schlusser 1912.	4	5	6	40.0	471.2	T. Head.	Pairs.....	Opposite..	Pump.....	Cellular..	Dual.....	Bosch.....	Hand.....	G. & A.....	Pressure..	Forced
Sehring 6.	6	3 1/2	4	37.2	238.3	I. Type..	Pairs.....	In Head..	Pump.....	Cellular..	.....	Optional..	Hand.....	Stromberg..	Gravity.....	Forced
Selden 47.	4	4 1/2	4	36.1	354.4	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Stromberg..	Gravity.....	Spl.....
S. G. V., A.	4	3 1/2	4 1/2	22.5	193.3	L. Head.	Bloc.....	L. Side.....	Pump.....	Cellular..	Single.....	Bosch.....	Fixed.....	Own.....	Gravity.....	Spl.....
S. G. V., D.	4	4	5 1/2	25.6	263.9	L. Head.	Bloc.....	L. Side.....	Pump.....	Cellular..	Single.....	Bosch.....	.....	Own.....	Gravity.....	Spl.....
Shelby 40.	4	4 1/2	5 1/2	27.4	280.6	L. Head.	Sep'rate.	Side.....	Pump.....	Tubular..	Dual.....	Remy.....	Hand.....	Schebler.....	Gravity.....	.....
Simplex 38.	4	4 1/2	6 1/2	38.0	485.3	T. Head.	Pairs.....	Opposite..	Pump.....	Tubular..	Single.....	Mea.....	Hand.....	Own.....	Pressure..	Forced
Simplex 38.	4	4 1/2	6 1/2	38.0	485.3	T. Head.	Pairs.....	Opposite..	Pump.....	Tubular..	Single.....	Mea.....	Hand.....	Own.....	Pressure..	Forced
Simplex 50.	4	5 1/2	5 1/2	53.0	597.2	T. Head.	Pairs.....	Opposite..	Pump.....	Tubular..	Single.....	Bosch.....	Hand.....	Own.....	Pressure..	Forced
Simplex 50.	4	5 1/2	5 1/2	53.0	597.2	T. Head.	Pairs.....	Opposite..	Pump.....	Tubular..	Single.....	Bosch.....	Hand.....	Own.....	Pressure..	Forced
Simplex 50.	4	5 1/2	5 1/2	53.0	597.2	T. Head.	Pairs.....	Opposite..	Pump.....	Tubular..	Single.....	Bosch.....	Hand.....	Own.....	Pressure..	Forced
Spaulding CP.	4	4	4	25.6	201.1	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Dual.....	Remy.....	Hand.....	Schebler.....	Gravity.....	Spl.....
Spaulding E.	4	4 1/2	5 1/2	27.3	280.6	L. Head.	Sep'rate.	L. Side.....	Pump.....	Cellular..	Double.....	Remy.....	Hand.....	Schebler.....	Gravity.....	Spl.....
Speedwell 12.	4	5	5	40.0	392.7	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Dual.....	Bosch.....	Hand.....	Schebler.....	Gravity.....	Spl.....
Spoerer 25A.	4	4 1/2	5 1/2	27.3	294.0	L. Head.	Pairs.....	R. Side.....	Pump.....	Cellular..	Dual.....	Bosch.....	Hand.....	G. & A.....	Gravity.....	Forced
Spoerer 40-C.	4	4 1/2	5 1/2	38.0	410.6	T. Head.	Pairs.....	Opposite..	Pump.....	Cellular..	Dual.....	Bosch.....	Hand.....	G. & A.....	Pressure..	Forced
Stafford.	4	4 1/2	4 1/2	27.3	247.2	I. Type..	Pairs.....	In Head..	Opt.....	Tubular..	Dual.....	Bosch.....	Hand.....	Stromberg..	Gravity.....	Forced
Staver 35-B.	4	4 1/2	5	30.6	300.7	T. Head.	Bloc.....	Opposite..	Pump.....	Cellular..	Dual.....	Splitdorf..	Hand.....	Schebler.....	Gravity.....	Spl.....
Staver 35-F.	4	4 1/2	5	32.4	318.1	T. Head.	Bloc.....	Opposite..	Pump.....	Cellular..	Dual.....	Simms.....	Hand.....	Schebler.....	Gravity.....	Spl.....
Staver 40-F.	4	4 1/2	5	32.4	318.1	T. Head.	Bloc.....	Opposite..	Pump.....	Cellular..	Dual.....	Simms.....	Hand.....	Schebler.....	Gravity.....	Spl.....
Staver 40-RR.	4	4 1/2	5	32.4	318.1	T. Head.	Bloc.....	Opposite..	Pump.....	Cellular..	Dual.....	Simms.....	Hand.....	Schebler.....	Pressure..	Spl.....
Stearns-Knight Runabout.	4	4 1/2	5 1/2	28.9	312.0	Sleeve..	Pairs.....	In Sleeve..	Pump.....	Cellular..	Dual.....	Bosch.....	Hand.....	Own.....	Pressure..	Spl.....
Stearns-Knight Regular.	4	4 1/2	5 1/2	28.9	312.0	Sleeve..	Pairs.....	In Sleeve..	Pump.....	Cellular..	Dual.....	Bosch.....	Hand.....	Own.....	Pressure..	Spl.....
Stevens-Duryea X.	4	4 1/2	4 1/2	36.1	319.0	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Own.....	Gravity.....	Spl.....
Stevens-Duryea AA.	6	4 1/2	4 1/2	43.8	404.1	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Own.....	Gravity.....	Spl.....
Stevens-Duryea Y.	6	4 1/2	4 1/2	54.1	478.5	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Own.....	Gravity.....	Spl.....
Stoddard-Dayton Savoy.	4	4	4 1/2	25.6	226.2	L. Head.	Bloc.....	Side.....	Thermal..	Cellular..	Dual.....	.....	Hand.....	Stromberg..	Gravity.....	Spl.....
Stoddard-Dayton Stratford.	4	4	5 1/2	27.3	290.7	L. Head.	Pairs.....	Side.....	Thermal..	Cellular..	Dual.....	Bosch.....	Hand.....	Stromberg..	Pressure..	Forced
Stoddard-Dayton Saybrook.	4	4 1/2	5	36.1	354.4	I. Type..	Pairs.....	In Head..	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Stromberg..	Pressure..	Forced
Stoddard-Dayton Special.	4	5	5 1/2	40.0	431.9	I. Type..	Pairs.....	In Head..	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Stromberg..	Pressure..	Forced
Stoddard-Dayton Special.	4	5	5 1/2	40.0	431.9	I. Type..	Pairs.....	In Head..	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Stromberg..	Pressure..	Forced
Stoddard-Dayton Knight.	6	4 1/2	5 1/2	48.6	349.9	Sleeve..	Three.....	In Sleeve..	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Stromberg..	Pressure..	Spl.....
Stutz A.	4	4 1/2	5 1/2	36.1	389.9	T. Head.	Pairs.....	Opposite..	Pump.....	Cellular..	Dual.....	Eisemann..	Hand.....	Schebler.....	Gravity.....	Forced
Stuyvesant 50.	4	4 1/2	6	38.0	448.0	T. Head.	Pairs.....	Opposite..	Thermal..	Cellular..	Double.....	Bosch.....	Hand.....	Stromberg..	Pressure..	Forced
Suburban Limited.	6	3 1/2	4 1/2	29.4	259.8	L. Head.	Pairs.....	L. Side.....	Thermal..	Cellular..	Dual.....	Simms.....	Hand.....	G. & A.....	Gravity.....	Spl.....
Thomas 6-40.	6	4 1/2	5 1/2	43.8	468.0	T. Head.	Pairs.....	Opposite..	Pump.....	Cellular..	Double.....	Optional..	Hand.....	Miller.....	Pressure..	Spl.....
Triumph.	4	4 1/2	5	28.9	283.6	L. Head.	Pairs.....	Side.....	Pump.....	Tubular..	Dual.....	Splitdorf..	Hand.....	Optional..	Gravity.....	Spl.....
Union 3.	4	3 1/2	4	20.3	165.1	I. Type..	Pairs.....	In Head..	Optional..	Tubular..	Single.....	Simms.....	Fixed.....	Schebler.....	Gravity.....	Spl.....
Vellie G.	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Double.....	Splitdorf..	Hand.....	Stromberg..	Gravity.....	Spl.....
Vellie Standard.	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Double.....	Splitdorf..	Hand.....	Stromberg..	Gravity.....	Spl.....
Vellie Special.	4	4 1/2	5 1/2	32.4	334.0	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Double.....	Splitdorf..	Hand.....	Stromberg..	Gravity.....	Spl.....
Virginian A-50.	4	5	5	40.0	392.7	L. Head.	Pairs.....	L. Side.....	Pump.....	Tubular..	Dual.....	Bosch.....	Hand.....	Schebler.....	Gravity.....	Spl.....
Warren 12-30.	4	4	4 1/2	25.6	226.2	L. Head.	Bloc.....	R. Side.....	Pump.....	Tubular..	Single.....	Bosch.....	Fixed.....	McCord.....	Gravity.....	Spl.....
Warren 12-35.	4	4 1/2	4 1/2	27.3	240.5	L. Head.	Bloc.....	R. Side.....	Pump.....	Tubular..	Double.....	Bosch.....	Hand.....	McCord.....	Gravity.....	Spl.....
Warren 12-40.	4	4 1/2	4 1/2	28.9	269.4	L. Head.	Bloc.....	L. Side.....	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Stromberg..	Pressure..	Spl.....
Westcott K-L-M.	4	4 1/2	5	32.4	318.1	L. Head.	Sep'rate.	Side.....	Pump.....	Cellular..	Dual.....	Bosch.....	Hand.....	Schebler.....	Gravity.....	Spl.....
Westcott R.	4	4 1/2	5	36.1	354.4	L. Head.	Sep'rate.	Side.....	Pump.....	Cellular..	Dual.....	Bosch.....	Hand.....	Schebler.....	Gravity.....	Spl.....
W. F. S., B.	4	4 1/2	5 1/2	32.4	349.9	L. Head.	Pairs.....	L. Side.....	Pump.....	Cellular..	Double.....	Bosch.....	Hand.....	Rayfield.....	Pressure..	Spl.....
White GAD.	4	3 1/2	5 1/2	22.5	226.4	L. Head.	Bloc.....	Side.....	Pump.....	Cellular..	Single.....	Bosch.....	.....	Own.....	Gravity.....	Spl.....
White GB.	4	3 1/2	5 1/2	22.5	226.4	L. Head.	Bloc.....	Side.....	Pump.....	Cellular..	Single.....	Bosch.....	.....	Own.....	Gravity.....	Spl.....
White GE.	4	4 1/2	5 1/2	36.1	363.3	L. Head.	Bloc.....	Side.....	Pump.....	Cellular..	Single.....	Bosch.....	.....	Own.....	Gravity.....	Spl.....
Wilcox 35.	4	4 1/2	5	28.9	283.6	L. Head.	Pairs.....	Side.....	Pump.....	Tubular..	Single.....	Mea.....	Hand.....	Stromberg..	Gravity.....	Spl.....
Winton 17-C.	6	4 1/2	5	48.6	477.2	L. Head.	Pairs.....	R. Side.....	Pump.....	Cellular..	Dual.....	Optional..	Hand.....	Stromberg..	Pressure..	Spl.....
Zimmerman Z-40-R.	4	4 1/2	5	33.0	292.1	L. Head.	Pairs.....	In Head..	Thermal..	Cellular..	Dual.....	Splitdorf..	.....	Schebler.....	Gravity.....	Spl.....
Zimmerman Z-40-F.	4	4 1/2	5	33.0	292.1	L. Head.	Pairs.....	In Head..	Thermal..	Cellular..	Dual.....	Splitdorf..	.....	Schebler.....	Gravity.....	Spl.....

ABBREVIATIONS: S. & H., side and head; R., right; L., left; Thermal, thermo-siphon water circulation; Spl., splash; In F'l, in fuel; Ell., elliptical; Plat., platinum; Spec., special; I-b-m, I-beam; M. Disc, multiple disc; E. B'd, expanding band; C. B'd, contracting band; Exp., expanding; C. & D., cone and disc; D. Pl., dry plate; A. & I., asbestos and iron; A. & S., asbestos and steel; C. I., cast iron; B. & S., bronze and steel; C. & B., cork and bronze; C. & S., cork and steel; F. & S., fibre and steel; F. & I., fibre and iron; Fa. & S., fabric and steel; I. & C., iron and cork; L. & I., leather and iron; L. & S., leather and steel; L. & C., leather and cork; L. & A., leather and as-

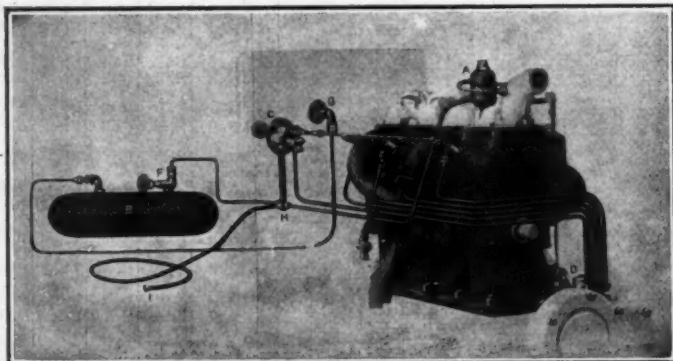
## the Market for the Season of 1912 — Concluded

Wheelbase	RUNNING GEAR					TRANSMISSION										BEARINGS						
	TIRES		SPRINGS		Front Axle	CLUTCH		GEARSET			Drive	Car Drives Through	Rear Axle	BRAKES		CRANK-SHAFT		Gear-set	Front Wheel	Rear Axle	Steer Knut's	Steering Gear
	Fr.	Rear	Fr.	Rear		Type	Fric. Surf.	Type	No.	Location				Ser.	Em.	Type	No.					
90	36x11	36x11	Cross	Ell.	I-b'm.			Fric.		Amid.	Chain	Rad. Rd.	Dead	Int.		Plain	2	Ball	Roll.	Roll.	Plain	Plain
103	32x3	32x3	Ell.	Ell.	Solid	Cone	Therm.		2	Jackh.	Chain		Dead	Int'		Plain	2	Plain	Roll.	Roll.	Plain	Plain
120	34x4	34x4	Ell.	Ell.	I-b'm.	Cone	L. & S.	Select.	3	Amid.	Shaft.	Tor. Rod.	Semi-float'g.	Ext.	Int.	Plain	2	Roll.	Ball.	Roll.	Roll.	Plain
126	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	4	Amid.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	3	Ball	Roll.	Roll.	Roll.	B&P
122	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	3	U. Mo.	Shaft		Floating	Ext.	Int.		4					
125	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	R. & S.	Select.	3	Amid.	Shaft	T. R. & S.	Floating	Int.	Int.	Plain	3	Roll.	Ball.	B&R	Plain	Plain
116	34x4	34x4	Ell.	Ell.	Channel	M. Disc	Steel	Select.	4	Amid.	Shaft	Springs	Semi-float'g.	Tran.		Plain	3	Ball.	Ball.	Ball.	B&P	Plain
118	34x4	34x4	Ell.	Ell.	Channel	M. Disc	Steel	Select.	4	Amid.	Shaft	Springs	Semi-float'g.	Tran.		Plain	3	Ball.	Ball.	Ball.	B&P	B&P
120	36x3	36x3	Ell.	Ell.	I-b'm.	Cone	Leath'r.	Select.	3	U. Mo.	Shaft	Tor. Tube.	Floating	Ext.	Int.	Plain	5	Roll.	Ball.	Roll.	Ball.	Ball
127	36x4	36x5	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	4	Amid.	Shaft	Tor. Tube.	Semi-float'g.	Ext.	Int.	Plain	3	Ball.	Ball.	Ball.	Plain	Roll
137	34x4	34x5	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	4	Amid.	Shaft	Tor. Tube.	Semi-float'g.	Ext.	Int.	Plain	3	Ball.	Ball.	Ball.	Plain	Roll
124	36x4	36x5	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	4	Amid.	Chain	Rad. Rd.	Dead	Tran.		B&P	3	Ball.	Ball.	Ball.	Plain	Roll
129	36x4	36x5	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	4	Amid.	Chain	Rad. Rd.	Dead	Tran.		B&P	3	Ball.	Ball.	Ball.	Plain	Roll
139	36x5	36x5	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	4	Amid.	Chain	Rad. Rd.	Dead	Tran.		B&P	3	Ball.	Ball.	Ball.	Plain	Roll
112	32x3	32x3	Ell.	Ell.	I-b'm.	Cone	S. & B.	Plan.	2	R. Ax.	Shaft	Tor. Rod.	Semi-float'g.			Plain	5	Plain	Ball.	Roll.	Plain	B&P
117	34x00	34x00	Ell.	Ell.	I-b'm.	Cone	L. & C.	Select.	3	Amid.	Shaft	Tor. Rod.	Floating			Plain	5	Ball.	Roll.	Roll.	Plain	B&P
121	00x4	00x4	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	3	Ball.	Roll.	Roll.	Roll.	Plain
120	34x4	34x4	Ell.	Ell.	I-b'm.	Cone	Leath'r.	Select.	3	R. Ax.	Shaft	Tor. Tube.	Semi-float'g.			Plain	3	Ball.	Ball.	Roll.	B&P	Plain
120	00x4	00x4	Ell.	Ell.	I-b'm.	Cone	Leath'r.	Select.	3	Amid.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	3	Ball.	Roll.	Roll.	Roll.	P&R
112	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	S. & B.	Select.	3	Amid.	Shaft	Tor. Tube.	Semi-float'g.	Ext.		Plain	3	Ball.	Roll.	Roll.	Plain	Plain
112	34x4	34x4	Ell.	Ell.	Channel	M. Disc	Steel	Select.	3	Amid.	Shaft	Rad. Rd.	Floating			Plain	3	Ball.	Ball.	Ball.	Plain	Plain
120	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	3	Amid.	Shaft	Rad. Rd.	Floating			Plain	3	Ball.	Ball.	B&R	Plain	Plain
124	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	3	Amid.	Shaft	Rad. Rd.	Floating			Plain	3	Ball.	Ball.	Ball.	Plain	Plain
124	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	3	Amid.	Shaft	Rad. Rd.	Floating			Plain	3	Ball.	Ball.	B&R	Plain	Plain
116	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	S. & R.	Select.	3	R. Ax.	Shaft	Tor. Tube.	Floating			Plain	5	Ball.	Roll.	Roll.	Plain	Ball
121	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	S. & R.	Select.	3	R. Ax.	Shaft	Tor. Tube.	Floating			Plain	5	Ball.	Roll.	Roll.	Plain	Ball
124	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	A. & S.	Select.	3	U. Mo.	Shaft	Tor. Tube.	Floating	Ext.	Int.	Plain	3	B&P	Ball.	Ball.	Plain	Ball
128	36x4	37x5	Ell.	Ell.	I-b'm.	M. Disc	A. & S.	Select.	3	U. Mo.	Shaft	Tor. Tube.	Floating	Ext.	Int.	Plain	4	B&P	Roll.	Ball.	Ball.	Ball
142	36x4	36x5	Ell.	Ell.	I-b'm.	M. Disc	A. & S.	Select.	3	U. Mo.	Shaft	Tor. Tube.	Floating	Ext.	Int.	Plain	4	B&P	Roll.	Ball.	Ball.	Ball
112	33x4	33x4	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	R. Ax.	Shaft	Rad. Rd.	Semi-float'g.	Ext.	Int.	Plain	3	Roll.	Roll.	B&R	Plain	Ball
114	36x4	36x4	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	R. Ax.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	3	Roll.	Roll.	B&R	Plain	Ball
122	36x5	36x5	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	3	Ball.	Roll.	B&R	Plain	Ball
122	36x4	36x4	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	3	Ball.	Roll.	B&R	Plain	Ball
130	37x5	37x5	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	3	Ball.	Roll.	B&R	Plain	Ball
133	37x5	37x5	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	7	Ball.	Roll.	B&R	Plain	Ball
120	34x4	34x4			I-b'm.	M. Disc	Steel	Select.	3	R. Ax.	Shaft	Tor. Tube.	Semi-float'g.	Int.	Int.	Plain	3	Ball.	Roll.	B&R	Roll.	Ball
126	36x4	36x4	Ell.	Ell.	I-b'm.	E.B'd.	A. & S.	Select.	4	U. Mo.	Shaft	Tor. Tube.	Floating	Ext.	Int.	Plain	3	Ball.	Ball.	Ball.	Ball.	Ball
110	34x3	34x3	Ell.		I-b'm.	M. Disc	S. & R.	Select.	3	U. Mo.	Shaft	T.T. & S.	Floating			Plain	4	B&R	Ball.	B&R	Ball.	Plain
134	36x4	37x5	Ell.	Ell.	I-b'm.	M. Disc	C. & S.	Select.	3	Amid.	Shaft	Tor. Tube.	Floating	Ext.	Int.	Plain	4	Ball.	Roll.	Roll.	Roll.	Roll
118	36x4	36x4	Ell.	Ell.	I-b'm.	Exp.	Leath'r.	Select.	3	Amid.	Shaft	Tor. Tube.	Floating	Int.	Ext.							
100	30x3	30x3	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	3	U. Mo.	Shaft	Tor. Tube.	Semi-float'g.			Plain	3	P&R	Ball.	B&R	Ball.	Plain
115	34x4	34x4	Ell.	Ell.	I-b'm.	M. Disc	S. & B.	Select.	3	Amid.	Shaft	Springs	Floating	Ext.	Int.	Plain	3	Roll.	Roll.	Roll.	Plain	Ball
118	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	S. & B.	Select.	3	Amid.	Shaft	Springs	Floating	Ext.	Int.	Plain	3	Roll.	Roll.	Roll.	Roll.	Ball
121	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	S. & B.	Select.	3	Amid.	Shaft	Springs	Floating	Ext.	Int.	Plain	3	Roll.	Roll.	Roll.	Roll.	Ball
130	40x4	40x4	Ell.	Ell.	I-b'm.	Cone	L. & S.	Select.	3	Amid.	Shaft	Springs	Floating	Ext.	Int.	Plain	3	Roll.	Roll.	Roll.	Roll.	Ball
110	34x3	34x3	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Springs	Semi-float'g.	Ext.	Int.	Plain	2	Plain	Ball.	B&R	Plain	Plain
112	34x3	34x3	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Springs	Semi-float'g.	Ext.	Int.	Plain	2	Plain	Ball.	B&R	Plain	Plain
116	34x4	34x4	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Springs	Floating	Ext.	Int.	Plain	3	Ball.	Roll.	Ball.	Plain	Plain
120	36x4	36x4	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Springs	Floating	Ext.	Int.	Plain	5	Roll.	Roll.	Roll.	Plain	B&P
120	36x4	36x4	Ell.	Ell.	I-b'm.	Cone	L. & I.	Select.	3	Amid.	Shaft	Springs	Floating	Ext.	Int.	Plain	5	Ball.	Roll.	Roll.	Plain	Plain
118	36x4	36x4	Ell.	Ell.	I-b'm.	C.D.	Steel	Select.	3	R. Ax.	Shaft	Rad. Rd.	Floating	Int.	Ext.	Plain	3	Ball.	Roll.	Ball.	Plain	Plain
110	34x4	34x4	Ell.	Ell.	I-b'm.	Cone		Select.	4	Amid.	Shaft		Semi-float'g.	Ext.	Int.	Ball.	2	Ball.	Ball.	Ball.	Ball.	Ball
120	34x4	34x4	Ell.	Ell.	I-b'm.	Cone		Select.	4	Amid.	Shaft		Semi-float'g.	Ext.	Int.	Ball.	2	Ball.	Ball.	Ball.	Ball.	Ball
120	36x4	36x4	Ell.	Ell.	I-b'm.	Cone		Select.	4	Amid.	Shaft		Semi-float'g.	Ext.	Int.	Ball.	2	Ball.	Ball.	Ball.	Ball.	Ball
115	00x3	00x3	Ell.	Ell.	I-b'm.	M. Disc	R. & S.	Select.	3	U. Mo.	Shaft	Tor. Tube.	Semi-float'g.	Int.	Ext.	Plain	3	Plain	Roll.	Roll.	Plain	Ball
130	36x4	36x4	Ell.	Ell.	I-b'm.	M. Disc	Steel	Select.	4	Amid.	Shaft	Rad. Rd.	Floating	Ext.	Int.	Plain	4	Ball.	Roll.	Roll.	P&R	B&P
116	34x3	34x3	Ell.	Ell.	I-b'm.	Cone	L. & S.	Select.	3	Amid.	Shaft	Tor. Tube.	Semi-float'g.	Ext.	Int.	Plain	3	Plain	Ball.	Roll.	Plain	Plain
116	35x4	35x4	Ell.	Ell.	I-b'm.	Cone	L. & S.	Select.	3	Amid.	Shaft	Tor. Tube.	Floating	Int.	Int.	Plain	3	Plain	Ball.	Roll.	Plain	Plain

bestos; R. & I., raybestos and iron; S. & B., steel and bronze; S. & R., steel and raybestos; S. & C., steel and cork; T. & I., thermoid and iron; U. Mo., unit motion; Amid., amidship; T. T. & R. R., torsion tube and radius rod; T. T. & S., torsion tube and spring; T. T. & R., torsion tube and rod; R. R. & S., radius rod and spring; T. & R. R., torsion and radius rod; S. & T. R., spring and torsion rod; I. & E., internal and external; B. & P., ball and plain; B. & R., ball and roller; P. & R., plain and roller.



Assembly of the Winton compressed air starting system



Chalmers compressed air starter. The parts are as follows: A, check valve; B, air tank; C, push rod; D, distributor; E, cylinder valves; F, shut-off valve; G, gauge; H, tire inflator valve; I, tire connection

UP to a few months ago the number of automobiles which had provision for the automatic or semi-automatic starting of their motors was confined to one or two prominent makes, notably the Winton and Amplex, which have been so equipped for a number of seasons. Yet a survey of the specifications of the 1912 cars will disclose the fact that not fewer than sixty makers have included some sort of self-starter in the equipment of their cars for this year.

Although self-starters and safety starting cranks have been on the market for several years, it was not until this season that manufacturers gave them serious consideration. A general and almost unanimous awakening to the self-starter's importance as a selling factor seems to have been reached. It is only natural that in the evolution of the automobile the automatic starting device should sooner or later merit serious thought, and the wonder is that it has waited until now for this attention.

There are at present several types of motor-starting devices, which may be classed as acetylene gas, electrical, compressed air, spring and lever starters. The type which appears to have the most extensive adoption is the first-named, the acetylene gas starter. There are several reasons to which the popularity of this class of starter may be ascribed, chief among them being its low cost and the extreme ease with which it may be attached to any motor, old or new. No alterations of the existing designs of engine and immediate parts are necessary in order to add the device.

Next to acetylene gas, compressed air starters seem to have the most adherents. A distinct point in favor of this type lies in the fact that the charge admitted to the cylinders is not explosive, as in the case of the acetylene gas type. The pistons are driven down by the compressive force of the air and not by

# Self-starters



explosive force, thus doing away with any danger, however slight, which might arise from the use of acetylene in the motor. On the other hand, the high pressure which must necessarily be maintained in the air storage tank of the compressed air apparatus might be considered an objection.

Only two concerns are equipping their cars with electric starters, whereas there are several which will make use of spring devices.

A list of the cars which will be equipped with self-starters for 1912, together with the type adopted by each, follows:

Name of Car.	Type.	Name of Car.	Type.
Alpena	Explosive gas	Lion	Explosive gas
American	Explosive gas	Louverne	Explosive gas
Amplex	Compressed air	Marion	Explosive gas
Atlas	(Not available)	Marmon	Explosive gas
Austin	Compressed air	McFarlin	Compressed air
Babcock	Explosive gas	McIntyre	Explosive gas
Bergdoll	Spring	Midland	Compressed air
Berkshire	Compressed air	Moline	Explosive gas
Cadillac	Electric	Moon	Explosive gas
Case	Explosive gas	Nance	Compressed air
Chalmers	Compressed air	Otto	(Not available)
Colby	Explosive gas	Patterson	Explosive gas
Cole	Explosive gas	Peerless	Spring
Corbitt	Explosive gas	Premier	(Not available)
Duryea	Lever	Pullman	Explosive gas
Elkhart	Explosive gas	Rambler	Spring
Empire	Explosive gas	Rayfield	Spring
Everitt	Explosive gas	Regal	(Not available)
G. J. G.	Explosive gas	Republic	(Not available)
Great Western	Explosive gas	Schacht	Explosive gas
Haynes	(Not available)	Selden	Explosive gas
Herreshoff	Explosive gas	Simplex	Explosive gas
Hudson	Explosive gas	Speedwell	(Not available)
Imperial	Spring	Streator	Explosive gas
Inter-State	Electric	Stuyvesant	Spring
Jonz	(Not available)	Suburban	(Not available)
Keeton	Explosive gas	Vellie	Compressed air
Kisselkar	Spring	Warren	Explosive gas
Kline Kar.	Spring	Westcott	Explosive gas
Lambert	Pedal	Winton	Compressed air
Lexington	Explosive gas	Zimmerman	Lever

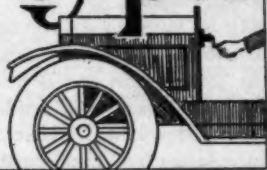
## Compressed Air Starters

### The Winton Self-Cranking System

For several years the Winton Motor Carriage Co., Cleveland, O., has featured a self-starting system on its cars. The principal parts of this system are the air storage tank and the distributor. The air which causes the pistons to move through their various strokes is admitted to the cylinders under pressure. During this movement of the pistons, which draws in fresh gas, the spark occurs, igniting the charge and causing the motor to begin its regular cycle of operations. The chief advantage claimed for this system is that the pistons are already under motion when the spark occurs, thus doing away with the sudden jar to the parts due to driving the pistons down violently from dead rest by starting on the spark. Attached to cylinders No. 3 and 4 are outlets through which a small portion of the pressure of each power stroke passes to the copper pressure tank carried between the left frame rail and the driving shaft of the chassis. In it the air under pressure is stored until required to start the motor.

The distributor valve is the only moving part of the system.

# of many types



Assembled on the dash are the gauge, which shows the amount of the tank pressure; the push button, which allows the compressed air to pass from the tank to the cylinders, and the shut-off valve for use when the car is to remain long idle. This valve prevents the loss of pressure from the tank. By pressing the dash push-button air flows through the distributor to one of the cylinders. The pressure forces the pistons to move, and as a piston passes the firing point the motor starts. If for any reason the first cylinder fails to fire the distributor sends the air to the cylinder next in order to fire, and forces the next piston past the firing point, and so on, if necessary, through the series of the cylinders.

## The Chalmers Starter

Like the other starters of the compressed-air type, the one which is placed on the cars made by the Chalmers Motor Co., Detroit, Mich., provides a charge of compressed air which forces down for the balance of the working stroke the piston which has stopped at the top of the compression stroke, or just beyond that point, then by means of a distributor the air supply is shut off from that cylinder at the end of the working stroke and forced into the next cylinder which is ready for this stroke. The valve which supplies the compressed air is a simple water-jacketed cast-iron check-valve located in the head of No. 1 cylinder. As the explosions occur in this cylinder, the pressure acting through the valve passage raises it, thus allowing a small amount of the combustion pressure to pass through and into the storage tank. This escapement is very slight on each combustion stroke and it ceases altogether as soon as the pressure in the storage tank balances that in the cylinder. The pressure in the former under normal conditions ranges from 100 to 150 pounds. The force by which the check-valve is held on its seat is controlled by a spring which is adjustable by a hexagonal nut at the top of the valve. The control or dash push-valve is a small, simple affair, located on the dash directly in front of the driver, so that by reaching out with his foot the push-button may be depressed. This releases the valve from its seat, allows air to flow to the distributor and at the same time operates a bar which opens the cylinder valves. Thus a passage is made from the distributor into the cylinder which is ready for the working stroke. The cylinder valves remain open as long as the dash push-valve is depressed, which is done until the motor starts.

The distributor consists of a steel disk, which is shown in the illustration. This disk is connected to the oil pump by a shaft and it revolves in a horizontal plane. In it is a slot or port and the air coming from storage tank passes through this port into the cylinder pipes which are uncovered successively as the disk revolves. Being positively geared, the action of the distributor is similar to that of a commutator, the cylinder which is ready for the working stroke receiving a supply of air at the same time as it would be fired. Except during the period of starting,



DETAILS OF CHALMERS STARTER PARTS.—Top, distributor disk. Disk B revolves on magneto shaft, and is held down by ball and spring A. Air enters at C and passes through port D into the cylinder pipes as disk revolves. Center, dash push valve. Rod N connects to cylinder valves. Air to distributor passes through valve T. Nut U regulates tension of valve spring. Lower left corner, cylinder valve. To open valve Z, arm X, which is connected to rod N, presses down on rod Y. Lower right corner, check valve. Spring Q holds valve P on its seat, through rod O. Air passes to storage tank through S.

the disk revolves idly on its seat, and it is held in place by a ball and spring which are controlled by a nut at the top of the distributor. The cylinder valves are of the poppet type and are held shut by stiff springs. A valve which is located just in front of the driver's seat in the floor board is provided so that the air can be shut off from the starter system when the car is to be left standing for any length of time, thus preventing leakage. A feature of the Chalmers starter is the small recess beneath the distributor disk, which recess is open to the outer air and is so placed as to uncover the port connecting with the compressed cylinder. The object of this is to relieve the compression and to allow the motor to be started with less compressed air than would otherwise be necessary. With this system a pressure of about 40 pounds is required to turn the motor over.

## The Wilson Starter

This starting system is made by the Wilson Motor Starter Co., Franklin, Pa., and its distinctive feature is the air pump which is operated by gearing from the motor layshaft, camshaft or from any other moving shaft only when the gears are meshed by the operator by means of a foot engaging treadle, as illustrated. In operating the system, the driver presses button A, which, due to the lever O, raises the valve N, thus permitting air to pass from the supply tank through the line C to D and then to F of the starter proper. From here it passes through F to the back of the piston G. This forces the piston down and causes

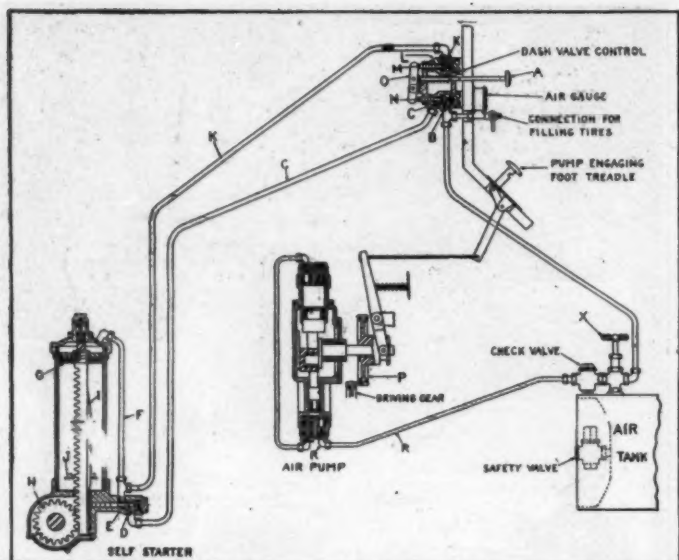
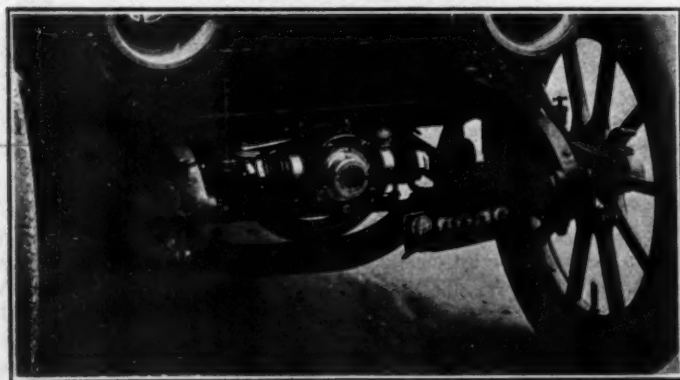


Diagram of Wilson compressed air starting apparatus

the rack I to revolve the gear H which engages with a clutch to the motor shaft, causing the crankshaft to be rotated. Due to this clutch arrangement, not illustrated, as soon as the motor starts the starter is free of same, and if the operator has released the button A the rack I returns automatically to its upper position ready for another start. The air back of the piston G is exhausted through the pipe K, through the orifice L and also through the holes J at the bottom of the piston stroke. From the construction is seen that the exhaust valve M and the supply valve N cannot be opened at the same time. The valve E in the starter proper cuts the air supply from the pipe F before the piston reaches the end of its stroke, so that the operator cannot waste air by continuing to press on the button A. In case of back-fire, the end of rack I is blank, which allows the gear to revolve free. The air pump is engaged at the will of the operator at any time the motor is running by pressing down on the pedal, which operation engages gear P with the driving gear. In from 8 to 18 minutes running of the small pump it furnishes enough air to start about thirty-five times, depending on the engine speed. Should the operator fail to stop the pump, a safety valve on the tank releases all pressure over 305 pounds.

#### The Amplex Self-Starter

This system is very similar to that used on the Winton, and it is placed on the Amplex cars of the Simplex Motor Car Co., Mishawaka, Ind., make. A diagram of the apparatus as used is shown in an accompanying illustration. The engine compresses the gas which is stored in the tank C. A small part of the pressure of each compression stroke passes through the check-valve A, which is located on the rear cylinder. By pressing on the push-lever B air under compression passes from the storage tank to the distributor and thence to the cylinder which is ready for



Showing Crescent starter attached to front of car

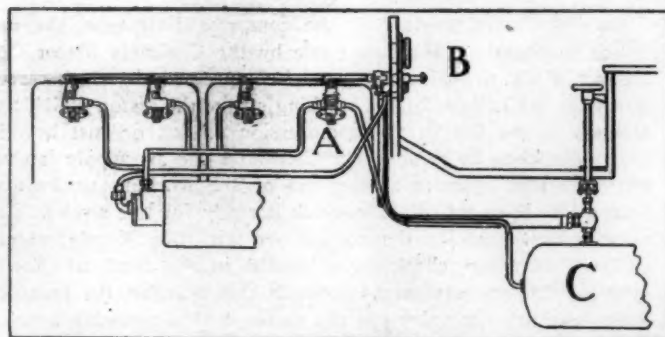
its working stroke. This forces the piston down and turns the crankshaft over, the charge of gas being admitted to the other cylinders and ignition then taking place in the usual way. There is the usual check valve at each cylinder, and also a valve at the seat by means of which the air may be shut off from the system to prevent leakage. Provision is also made to prevent the pressure in the tank from reaching an excessive value.

#### The Janney-Steinmetz System

This outfit makes use of an auxiliary two-cylinder compressor G, see diagram, which is driven from the engine by means of a positive clutch, this latter being provided so that the compressor may be put into or out of service as required. A multiple-port distributor which is shown diagrammatically at B is mounted on the compressor, and is geared so as to rotate with the motor at camshaft speed, thus sending air into the cylinder which is ready for its downward stroke and turning the motor over. A pressure gauge C is fixed on the dash and shows the condition of the air in the tank F. The foot valve D is used in starting to admit air to the distributor and from here to the proper cylinder. The system may also be arranged so that the distributor runs free from the pump. For instance, it may be mounted on the stem of the timer. A feature of the compressor is that either of its cylinders will operate separately, this being of advantage should one or the other or them get out of order for any reason. In operation the air is carried in the tank at a pressure of from 80 to 150 pounds, and the compressor will work properly at any speed ranging from 150 to 200 revolutions per minute. The Janney-Steinmetz Co., Philadelphia, Pa., is the manufacturer.

#### Other Compressed Air Starters

An apparatus of this kind is put out by the Start-Light Co., Chicago. There is an air storage tank, cylinder check-valves,



Amplex air starting system

pressure gauge, combined distributor and air compressor and diaphragm governor which automatically controls the pressure in the tank. When the pressure in the tank reaches a set minimum this governor causes the compressor to operate. The system is carried out in much the same manner as those already explained, starting being effected by means of a foot push-button.

The Crescent Air System Co., Detroit, also makes an air starter of peculiar form. A metal frame is attached to the car just in front of the radiator. On this frame a brass cylinder of crescent shape is mounted. Contained in this cylinder is a curved piston rod, having its piston on one end, the other being attached to an arm. This arm or crank is fulcrumed on a hollow shaft through which the engine shaft operates. A pawl on the arm engages and turns a ratchet on the crankshaft, thus revolving the crankshaft when a supply of air is admitted to the cylinder. Included in the outfit are an air tank and compressor. The admission of air to the cylinder is controlled in the usual way by a device easily accessible from the driver's seat.

One of the cleverest of the starting apparatuses lately brought out is that of the Artizan Brass Co., Chicago. The crankshaft is turned over two or three times by an impulse received from an arrangement of cylinder and piston connected to an automatic clutch. The piston of the cylinder is driven down by compressed air which is admitted when starting of the

motor is desired. The air is compressed by a small compressor placed on the back of the frame of the car. The cylinder part of this compressor is attached to the axle, while the piston is fixed to the chassis above it. Each vibration of the car forces this piston down, thus sending air through a check valve into the storage tank, which is located at any convenient point on the car frame.

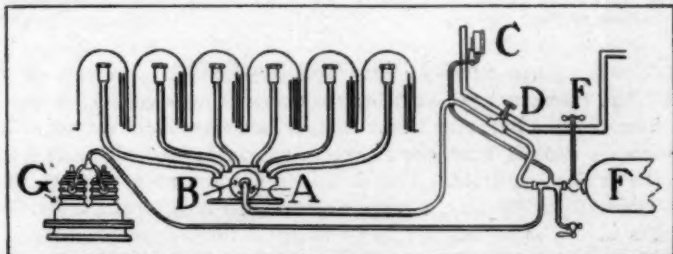
The new Velie models produced by the Velie Motor Vehicle Co., of Moline, Ill., will be equipped with compressed-air starters, the principle of operation being the same as that of the Chalmers. The air is stored in a tank under a 150-pound pressure, this pressure being produced by means of large plunger valves which are operated by power from each compression stroke. The distributor admits the air to the cylinders in the usual way in their regular order of firing, and the crankshaft is turned over by this means until the engine takes up its cycle of operations under its own power.

## Explosive Gas Starters

### The Disco Acetylene Starter

The starter of this name is made by the Ignition Starter Co., Detroit, Mich. It is simply a device which enables the operator to inject a small amount of gas into each of the cylinders of his engine, which gas forms an explosive mixture only when mixed with the air in the cylinders. This mixture is ignited by the spark in the usual way, thereby putting the motor in motion and making it pick up its regular cycle of operation. The Disco is a high-pressure system, the charge being sent to the cylinders under the pressure of the ordinary acetylene tank.

Its construction is very simple, as may be seen from the illustration. The handle which connects with the distributor is the only part with which the driver is concerned when starting the

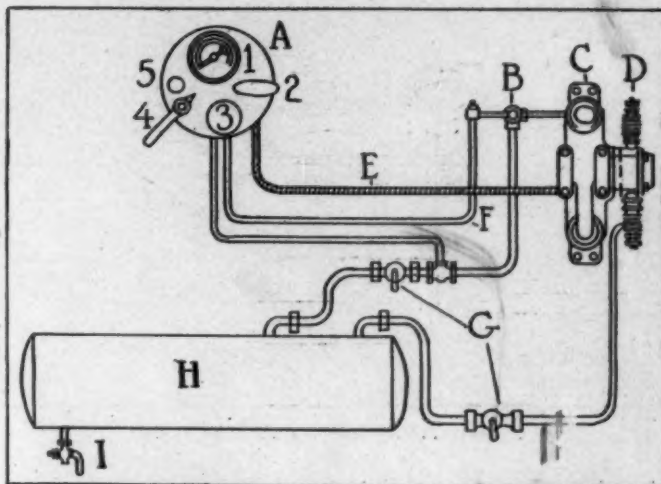


Janney-Steinmetz compressed air apparatus, showing two-cylinder auxiliary air compressor

car. From the gas tank a two-way connection permits of the use of the same gas for lighting the headlights as for starting the motor. From the connection S a pipe leads to the distributor at K, while the headlights are supplied through L. From the distributor the gas is piped to each of the cylinders, being introduced into them through the special valves shown at C-1-2-3-4. The needle point shown on the distributor is provided so that adjustment of the amount of gas admitted to the cylinders when the handle is turned over is possible. The distributor handle is made so as to be easily removable so that when the car is in a garage the owner may prevent tampering with the starting device. One turn of the distributor handle is sufficient to charge the cylinders when the gas tank pressure is above 70 pounds. Below this pressure it is sometimes necessary to give the handle more than one turn. After injecting the charge into the cylinders in this way the spark is turned on, thus igniting the explosive mixture and starting the motor. The makers state that with careful operation one gas tank can be used to start the motor about 6,000 times. The Disco is to be included as part of the regular equipment for 1912 of the Hudson, Everitt, Moon, Westcott, Colby and Pullman cars, and as optional equipment on the Selden.

### The Prest-O-Starter

This starter also operates by charging the cylinders with an explosive mixture of acetylene gas and air and igniting the

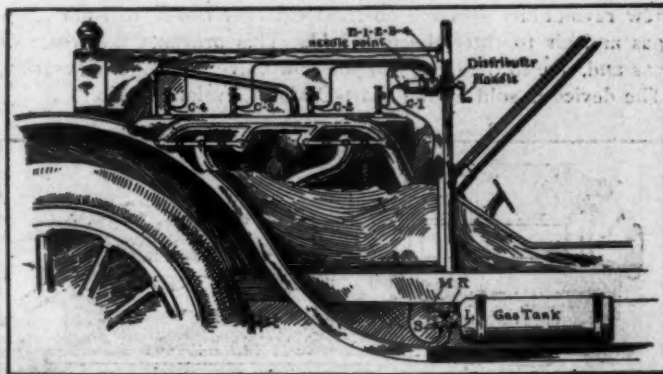


Crescent air system. A, dash plate; B, controller; C, air crank; D, compressor; E, cable; F, rod; G, shut-off valves; H, air tank; I, drain; 1, gauge; 2, compressor button; 3, air crank button; 4, tire valve; 5, tire hose valve.

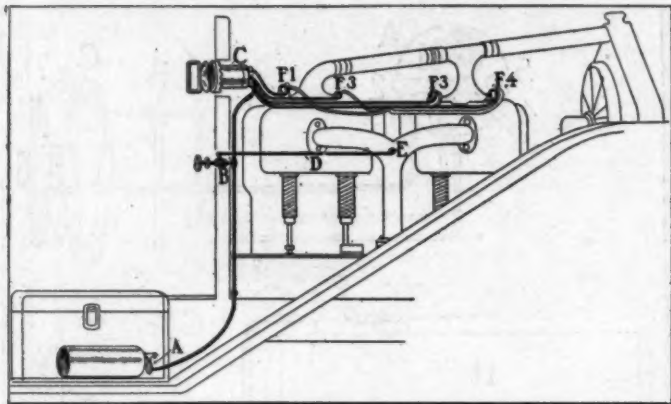
charge in the usual way. It is manufactured by the Presto-O-Lite Co., Indianapolis, Ind. Unlike the Disco, this is really a low-pressure starter, and the charge which is admitted to the cylinders is sent to them by means of pumps. The pressure of the gas in the starter is 2 ounces, this reduction from the high pressure in the gas tank being accomplished by means of the reducing valve A. The multiple pump is shown at C in the illustration. The gas is piped from the reducing valve to this pump, which is really four small ones (or six for a six-cylinder motor), and then to the cylinder check valves F-1-2-3-4. The handle of the pump P appears on the dash and corresponds to the crank of the Disco outfit. Each of the small pumps which go to make up the multiple pump P has a ball check-valve, while there are also check-valves at each of the cylinders. This multiplicity of check-valves effectively prevents the explosive pressure from reaching the pumps. A special feature of the system is the auxiliary pipe D which leads from the main pipe through the by-pass valve B to the intake manifold at E. The object of this is to provide a means of running the motor on acetylene gas for a few moments in order to allow a gasoline mixture to be formed in case it has not been produced in sufficient amount to run the motor after the crankshaft has been turned over several times by the starter. This is particularly advantageous in cold weather when the proper explosive gasoline charge is slow to form. Ordinarily, to start the motor, the handle of the multiple pump is pulled out and pressed in again one or two times, thus changing the cylinders, after which this charge is ignited by switching on the electric current.

### The American Acetylene Engine Starter

The principal of this starter, which is produced by the American Starter and Carburetor Manufacturing Co., Chicago, is very much the same as that of the two explosive starters already



Disco acetylene gas engine starter, BUZZO

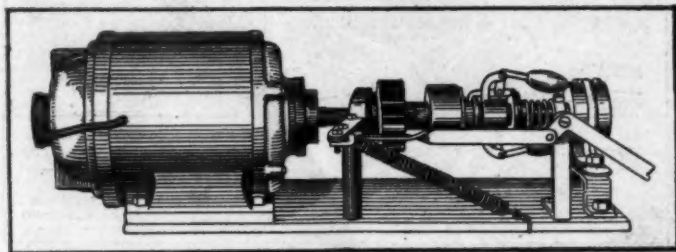


Showing Prest-O-Starter attached to motor

described. The charge is introduced into the cylinders through the priming cocks and it is a mixture of gas and air, the gas coming from the ordinary gas tank. Besides this tank, an auxiliary tank is placed under the footboard. The gas is piped from the regular tank to the controller on the dash, from which one pipe leads to the headlights, while another passes to the auxiliary tank, the flow to each of these sources being controlled by valves. To operate, the starter valve is turned on until the gauge indicates a pressure of 30 pounds, when a push-rod is pressed with the foot. This allows gas from the auxiliary tank to flow through a needle valve to the pipes which lead to the cylinders. The check-valves, through which the gas passes into the cylinders, prevent the loss of any of the compression. By the injection of several charges it is claimed that the starter will operate satisfactorily on as low a tank pressure as 5 pounds. The starter is included in the standard equipment of this year's Case cars.

#### The Victor Starter

The Victor starter operates on the principle that during the last few strokes of the motor upon stopping, a proper mixture of acetylene gas and air is admitted to the cylinders. The motor is then started on the spark at such later time as desired. The gas which is admitted to the cylinders being fixed, it is unaffected by variations of temperature, humidity or barometric pressure, which makes it possible to store it in the cylinders ready for later spark starting. Referring to the diagram, the ordinary acetylene gas tank is shown at J and from it the gas for starting passes through the two-way valve G to the valve B, only when the button F on the dash is pressed. This button is held so that the valve is closed when not in use by the spring H. Admission of the gas through B forces the valve E up, thus allowing the gas to pass through C and into the intake manifold. The valve A is provided to permit of the regulation of the amount of gas admitted to the intake manifold when F is pressed. At B the gas is mixed with air entering through D, which is connected with the outside air by a rubber tube passing to the side of the bonnet. Until the motor slows down to the last few revolutions pressure on the dash foot rod F will not allow gas and air to enter the manifold. This prevents the waste of gas and, due to the design of the flow valve, prevents back firing. The device is sold by the Start-O Co., Cleveland, Ohio.



O'Neill electric system, showing centrifugal governor

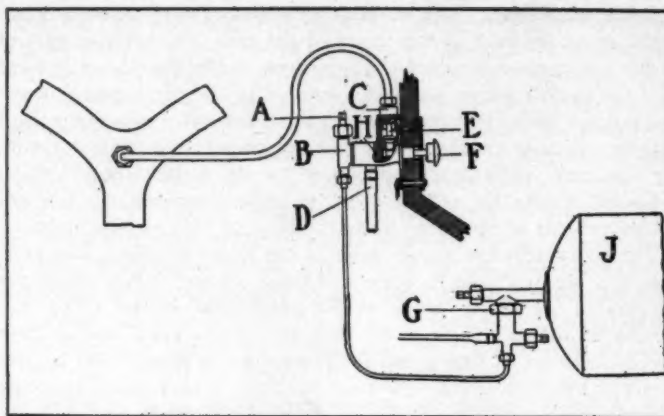
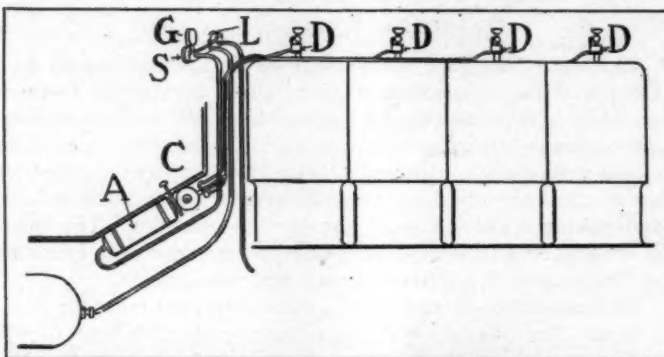


Diagram of Victor acetylene starter



American starter. A, compression tank; C, pedal on floor board; D, cylinder check valves; G, gauge; L, valve controlling lights; S, valve controlling starter

#### The Instantaneous Starter

The Instantaneous Auto Starter Co., of Cincinnati, O., is manufacturing what they term a cold weather auto starter. It utilizes the gas from the acetylene gas tank, introducing it into the intake manifold. The device is not intended to start the engine from the seat, it being necessary to turn on the acetylene gas in the same manner as if using it for lighting the lamps. There is a rubber bulb between a starter valve and the gas tank valve. In starting, this bulb is pressed until all air is out of the piping between the starter valve and the tank valve. This produces a suction when released, and the tank valve is then slowly opened and enough gas is allowed to flow from the tank into the bulb to fill it. The flow of gas from the acetylene tank is stopped before the starter valve is opened to admit the gas into the manifold. The charge being admitted to the cylinders, it is exploded by the spark to start the engine. Should no one of the cylinders be ready for its working stroke, it is necessary to give the motor a quarter turn with the crank.

#### The A. A. Starter

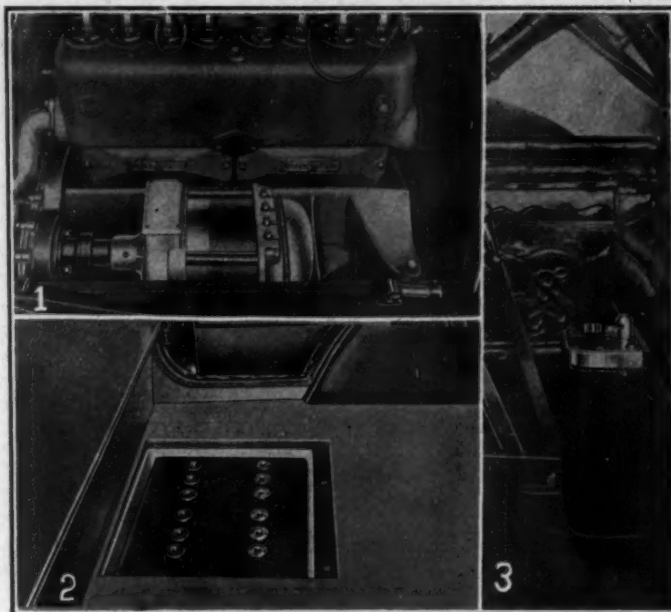
The starter of this name is put out by the Auto Appliance Co., Akron, Ohio. It can be applied to any motor which is equipped with a dual ignition system. While it is an internal combustion starting device, it introduces through a pump firing charges of gas and air into the cylinders instead of pure gas. This is accomplished by means of a revolving disk having a single port hole. In the head of the pump barrel there are also as many port holes as there are cylinders, and the gas is distributed to the cylinders through these holes when each of them in turn registers with the opening in the disk. The gas is held in check by means of a special form of valve located at the tank. When a pedal, which is accessible from the driver's seat, is released from a holding dog, it is forced in automatically by a spring. This allows gas to pass through a positive regulating needle valve into the pump barrel, the dimensions of which are 2 3-4 inches by 6 inches. Here the entering gas is mixed with

air which enters through a ball-check valve. On the forward stroke of the pedal the mixture is forced into one of the cylinders, through the action of the revolving disk. In order to charge the entire motor it is necessary to force the piston forward as many times as there are cylinders. For use in extremely cold weather a by-pass is provided. It can be opened after the motor has been charged in the usual way, thus allowing pure acetylene gas to enter the intake manifold where it is mixed with the air which has passed through the carbureter. This produces a mixture which will keep the motor running until a sufficient amount of gasoline can be brought up from the carbureter.

## Electric Starters

### The Delco Electric Starter

This electric system, which is the product of the Dayton Engineering Laboratories Co., Dayton, O., is used for ignition and lighting as well as for starting the motor. It is a part of the regular equipment of all Cadillac cars for 1912. The chief parts are the motor generator, storage battery, automatic cut-out device, regulator and control switches. The motor-generator operates either as a motor or generator, depending on whether it is being used for starting or for igniting the charges and lighting the lamps. For starting the engine the generator is temporarily and automatically transformed into a motor, the current required to operate it as such being furnished by the storage battery. The operator, after taking his seat in the car, presses a button and pushes forward on the clutch pedal. This automatically engages a gear of the electric motor with gear teeth in the periphery of the flywheel of the engine, causing the latter to rotate. As soon as the engine takes in charges of gas from the carbureter and commences to run on its own power, the operator releases the pressure on the clutch pedal, the electric motor gear disengages its connection with the flywheel, and the car is ready to be driven. The electric motor then again becomes a generator and its energy is devoted to ignition and to charging the storage battery. This latter has a capacity of 80 ampere-hours, and as soon as this capacity is reached the charging automatically ceases.

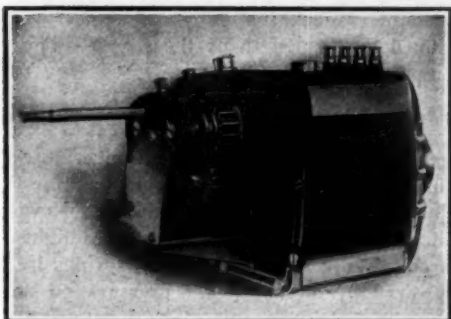


Aplico combined electric starting and lighting system. 1. View showing motor-generator installed. 2. Storage battery is located under floor of tonneau. 3. Controller box on front seat

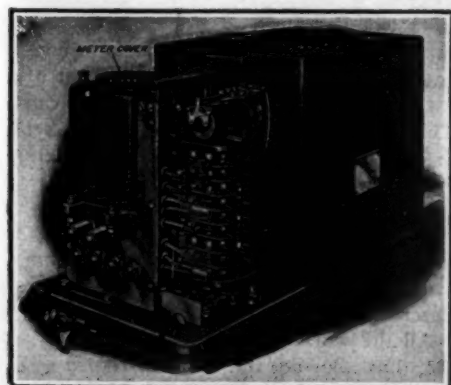
The battery is of sufficient capacity to rotate the crankshaft for about 20 minutes if necessary.

### The Aplico Electric Starting System

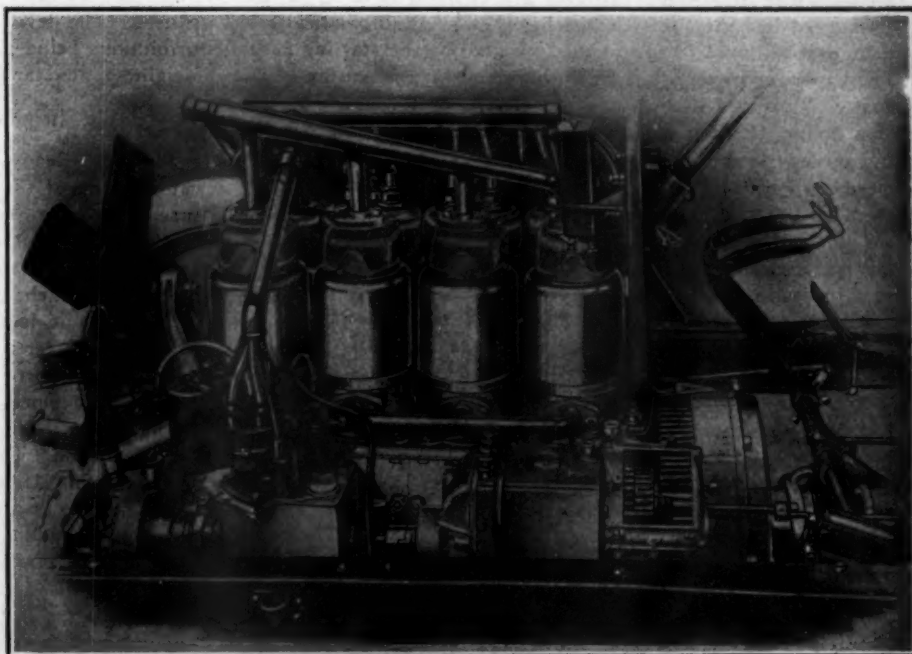
The Apple Electric Co., Dayton, O., is also putting an electric starting system on the market. It does not differ materially from the Delco, and the combined motor and generator together with controller and storage battery are also present. The motor-generator is driven from the crankshaft or propeller shaft in any convenient way, either by gears or chain. The front part of the housing of this motor-generator contains reducing gear mechanism and also the automatic clutches which serve to release these



Delco motor-generator

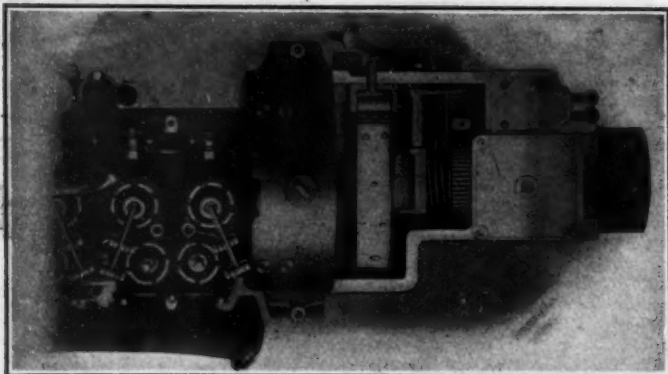


Delco controller and storage battery



THE APPLICATION OF THE DELCO ELECTRIC STARTING, LIGHTING AND IGNITION SYSTEM TO THE 1912 CADILLAC CAR.

The magneto distributor and distributor coil are at the left, while the motor-generator is placed a little to the right of the center, so that its gear will mesh with the teeth cut on the periphery of the flywheel. The edges of the teeth are rounded much the same as those of transmission gears to permit of easy engagement. The battery box, which carries with it the regulating meter and controlling switch, are not seen, being carried on the dash. The storage battery has a capacity of 80 ampere-hours.



Gardner automatic engine starter, showing its installation between motor and transmission, and its adaptation to unit power plant construction

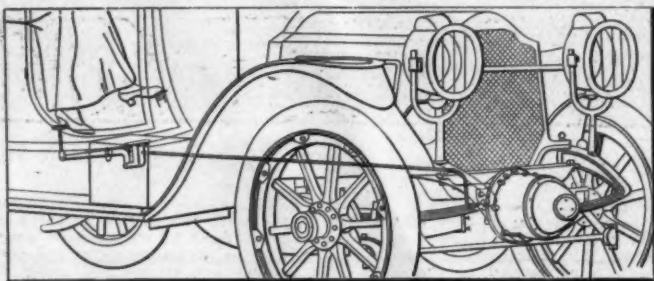
reducing gears as soon as the motor is running under its own power. To start the motor, a small lever on the controller is pulled. This sets the starting motor in operation, causing it to draw current from the storage battery, and to turn the crankshaft in the usual way. No part of the apparatus is placed on the dash, the controller being put on a panel under the driver's seat. The apparatus is so interlocked that it is impossible to operate the starting mechanism until the spark has been retarded and the gear shift lever is in the neutral position. The motor-generator is 18 inches in length by 7 1/4 inches in diameter and weighs about 70 pounds

#### The O'Neill System

This system consists of vaporizing the gasoline within the carbureter, releasing the compression, rapidly spinning the motor, and thus producing suction, compression and ignition by electrical means. The system is carried out by the use of an electric generator in connection with special storage batteries which float on the line, automatic governors controlled by magnetic and centrifugal force, and gear transmission between the flywheel and the driving pinion on the generator shaft. For starting duty, the motor-generator runs as a motor, and for lighting or battery charging it operates as a generator, as in the Delco system. The accumulators or storage batteries are charged in multiple and discharged in series, this change being effected automatically by a multi-pole, double-throw switch operated by the starting pedal. The vaporizer used within the carbureter is at the bottom of the float chamber and it consists of an electric button about the size of a dollar. In it is a high resistance which heats the gasoline and serves to vaporize it when the current is on. The generator speed, and hence its output, is kept constant regardless of the speed of the car by means of the centrifugal governor seen in the illustration. The system may be geared to the flywheel or it may be friction-driven, but in either case the drive is mounted on a loose sleeve that fits over the armature shaft, to which the governor, with cone clutch fitted thereto, is feather-keyed. A pedal on the foot board controls the whole series of operations involved in starting.

#### The Elba Electric System

The Willard Storage Battery Co., Cleveland, O., makers of the Elba line, are also putting out a combined self-starting and electric-lighting system. The battery with this outfit is a 12-volt affair, producing a starting effort of 300 foot-pounds in connec-



Attachment of the Ever-Ready starter to front of machine

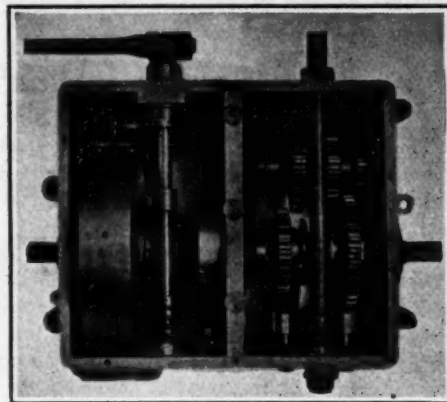
tion with a motor weighing 35 pounds. The gear ratio between the motor and the engine crankshaft is 18 to 1. In other respects the system does not vary materially from the electric systems already mentioned.

### Spring Starters

#### The Gardner Automatic Engine Starter

This device, which is the product of the Gardner Engine Starter Co., Chicago, is unique in that it is purely mechanical

and is a gearless control of stored energy secured from the momentum of the car through the rear axle and drive shaft. On the propeller shaft is mounted a brake drum within which is a compound concentric spring. The device is located preferably between the flywheel and the gearbox, as illus-



Gardner starter installed in same case with transmission gears

trated. It is designed with the idea of being made an integral part of the car; and for this reason is not adaptable to old machines unless they have unit power plants, for which type of construction a special case for the device is provided, thus affording a means of bolting it to the engine housing. The brake band is actuated by the clutch pedal, which also provides the car with a powerful transmission and clutch brake. The spring is wound and unwound in the same direction, which dispenses with gears and idlers, as no reverse motion occurs. It is very long, this being possible within the small space provided because it is at all times under high tension and only one-quarter of the full wind is used. The device whirls the crankshaft rapidly, the number of revolutions being determined by the length of the spring. The weight of the starter complete is about 45 pounds.

#### The Ever-Ready Automatic Starter

The Ever-Ready starter, which is attached to the front of the car in place of the ordinary starting crank, has been manufactured for some years by the American Ever-Ready Co., New York. It is about the size of an ordinary automobile headlight and looks like one reversed. There are two powerful springs in the device which are released by a very slight pressure on a pedal which is located near the driver's seat. The illustration shows the starter in use. When released the springs revolve the crankshaft six or eight times at a speed of about 300 revolutions per minute. Once the engine is running it rewinds the device automatically. When wound it disengages and is ready for the next operation. The starter will start the motor if it is in condition to run. However, if for any reason the engine is out of order and the device unwinds without starting it the former can be rewound by hand. This is made safe and easy to do by a set of reducing gears. The company makes three sizes of starters for engines of various horsepowers.

#### The Elder Starter

This starter, which is produced by the Elder Manufacturing Co., Indianapolis, Ind., does not differ a great deal from the spring devices already described. The starter is in the shape of a drum with flat ends. All the working parts are inclosed in a housing which is oil tight, thus allowing the gears to run in oil. The drum can be placed in front of the radiator or behind it, or it may be placed under the front seat by extending the drive

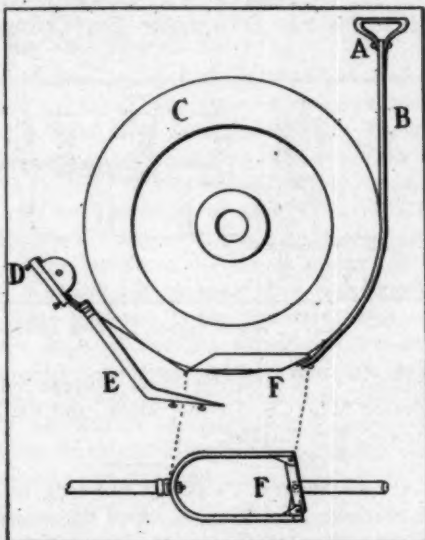
shaft. After the motor spring is wound, the device is ready to start the engine. Pressure on a foot lever connects the starter to the engine, at the same time tripping the spring. In unwinding this spring rotates the crankshaft in the usual way, turning it over 8 or 10 times. As soon as the engine starts the spring is rewound to a certain tension when the two are disconnected automatically, leaving the starter in readiness for the next start. During the rewinding operation the drum turns once to each 15 turns of the crankshaft. The device is so constructed that back-firing will not damage it.

## Lever and Pedal Starters

### The Star Starter

This device is put out by the Star Starter Co., Rochester, N. Y. It serves to start the car from the driver's seat by means of a lever, and it contains in its construction a safety feature protecting the operator from the ill effects of back-firing. The starter proper is attached to the crankshaft, the starting crank first having been removed. A short shaft is furnished which engages with the clutch on the countershaft and the starter is lined up with it. A

chain running over a disc passes through a pulley at the corner of the hood. Here it is attached to a rod which is connected to a lever at the driver's seat. A four-way clutch fitted to the crankshaft prevents the danger of a kick. When the lever is pulled, the crank is spun just as if the hand crank were used, while the spiral spring disengages the starting device and brings it back into position. Referring to the illustration, the

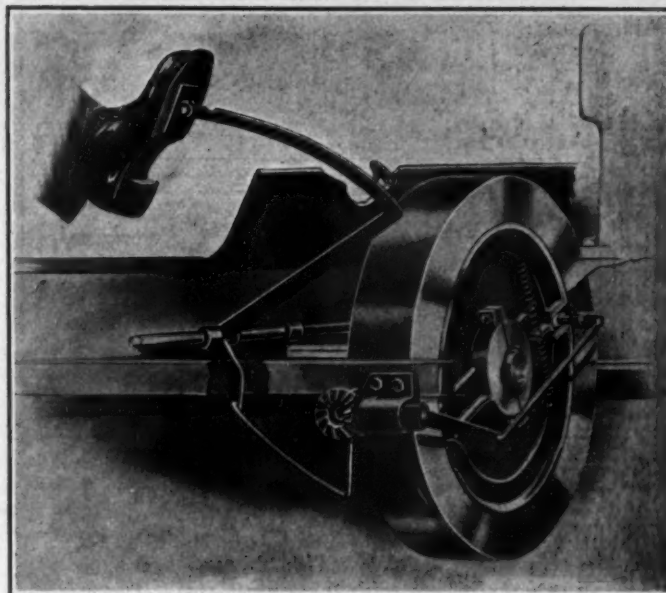


Kimball starter which grips the flywheel and permits the turning of the crankshaft from the seat thus starting the motor.

safety clutch for guarding against back-fire is shown at D. The spring B is wound around the main shaft C, the adjusting nuts A being used to regulate the tension in this spring, which serves to counteract the initial compression of the motor. The entire front part of the starter is enclosed by a dust-proof cap N, which is fastened to the chain pulley F by means of the lock stud E. The starter frame G is pinned to the pulley F, and when the latter is turned, the engagement of the dogs H and ratchet K causes the shaft M connecting between the crankshaft and starter shaft to be turned. In the event of a back-kick the dogs will prevent the ratchet from reversing its motion. Also, after the motor has been started, these dogs are thrown out of engagement with the ratchet, and hence with the starter, by centrifugal force.

### The Glenard Starter

The National Motor Device Co., Chicago, is marketing the device of this name. It consists of a 12-inch frictional clutch which is made up of two expanding rims. The width of these gripping rims is 1 inch and they are mounted on a guide or hanger attached to the crankcase bearing. The starter operates either in the flange of, or on the face of the flywheel. The frictional clutch works in a steel drum in connection with gears having a ratio of 9 to 14. These gears are mounted on roller-bearings and they are connected by levers to the pedal. Pressure on this pedal causes the expansion of the clutch by means of these gears and



Details of construction of the Glenard lever starter, which is attached to the flywheel

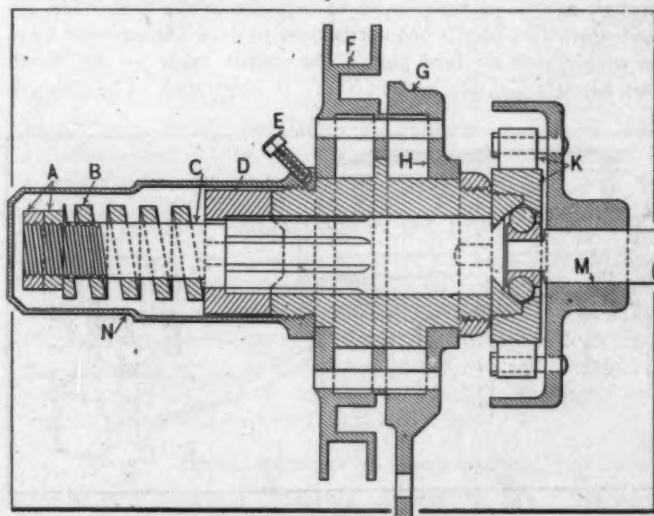
link connections. This expansion forces the clutch to grip the drum, and further pressure then pulls the crankshaft over. Obviously, the greater the foot pressure, the harder the clutch grips and the more certain its action. Should the motor back-fire, the clutch releases automatically. The device is very light and simple of construction and is adaptable to any motor having its flywheel in the rear.

### The Kimball Starter

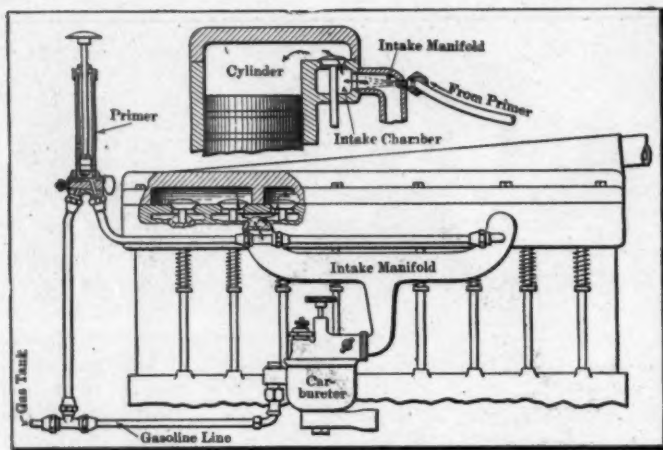
The device recently put out by the Kimball Tire Case Co., Council Bluffs, Ia., is a very simple affair for turning the motor over by hand without leaving the seat. The main feature of this starter is the clamp F shown in the illustration. By means of a combination of levers this clamp grips the rim of the flywheel C. By pulling on the handle A which comes up through the floor of the car and which is connected to the strap B the clamp tightens up on the flywheel, thus turning the engine over. As the engine starts the clamp loosens and is pulled back into its original position in the guard E by means of the spring D. The weight of the entire appliance is about 5 pounds.

### The Wilkinson Motor Starter

This apparatus simply substitutes the pedal for the hand crank, and by a system of reciprocating levers enables the driver to start the car much easier than by the use of the hand crank. It



Star Safety starting device

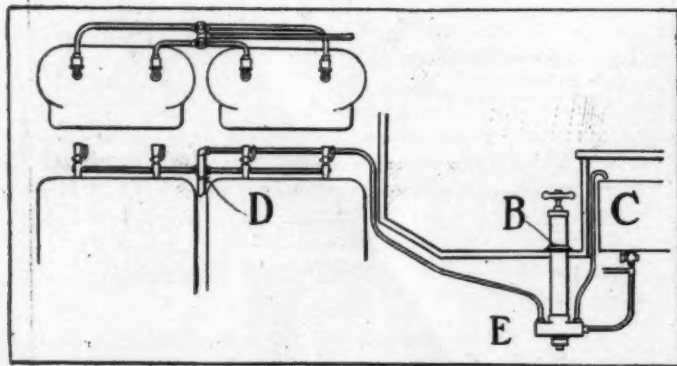


K-E-W motor primer, which injects an explosive mixture into the intake chambers

is put out by the Brown & Murray Co., Detroit, Mich. Four studs are inserted in the side of the flywheel and a pedal is located so that the operator while sitting in the seat of the car can press down upon it, thus bringing a thrusting finger into engagement with one of the four studs. The continuation of the foot pressure causes the flywheel to pass through a half-revolution and finishing the stroke past the ignition point of the most retarded spark. This happens except when the movement is arrested by an advanced spark or other pre-ignition which would cause the motor to rotate backward. In this case the contact between the thrusting finger and the stud would be instantly released, due to the action of an eccentric pawl or idling dog, one end of which is pivoted to the thrusting finger, while the other end drags loosely about the concentric surface. The purpose of the idling dog is to govern the course of the engaging end of the thrusting finger, causing it to travel in an outside radius as it advances, and in an inner radius as it retracts. Whether the motor reverses at the beginning of the stroke, the finish of the stroke, or at any intermediate point the contact is immediately broken thereby averting possible injury to the mechanism or driver from back-fire. When the pedal is not in use for starting the motor, the device is at rest, as it is mounted stationary, and has no contact with any of the moving parts of the motor. In the mechanical construction of the device two levers are so arranged as to impart greatest power at the time the resistance is greatest, thus equalizing the amount of power required to start the engine.

### Primers and Starters

Cylinder primers are all operated along very much the same lines, the fuel being injected either into the cylinders themselves through special priming cocks or into the intake manifolds. A hand-operated pump is ordinarily used to draw the gasoline from the supply tank or feed pipe. The primer made by the North East Electric Co., Rochester, N. Y., is illustrated. The pump B



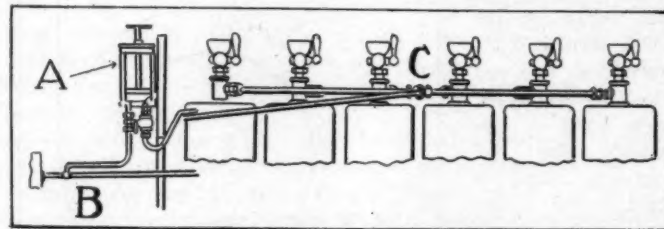
Arrangement of North East primer

acts as a suction pump to draw the gasoline from the supply into a mixing chamber E which is combined with the pump. After the charge has been brought into the pump the latter acts as a force pump to send it to the rotary distributor D, from which it is directed to the cylinder ready for its down stroke.

Another primer which has recently been brought out is the K-E-W, manufactured by the K-E-W Mfg. Co., New York City. The gasoline is brought into the primer cylinder from the carburetor supply pipe. It is then forced into the intake manifold through a special form of spray nozzle. An upward stroke of the handle fills the primer cylinder, and a downward stroke forces it into the valve chambers of the motor.

Similar to the North East priming device is that of the Reagan Grate Bar Co., Philadelphia, Pa. In this case the pump A is located on the dash. The gasoline is drawn from the pipe at B and, by means of the pump, is forced into the distributor C, which directs it to the proper cylinder.

There are a number of other makes of various forms of starting apparatus, the details of which are not available. Among these are the Briggs & Stratton Co., Milwaukee, Wis.; The Dean Electric Co., Elyria, O.; Motor Devices Mfg. Co., La Crosse, Wis.; The Home Light Co., Chicago; The Motor Starting Co., Indianapolis, Ind.; Lockwood-Ash Motor Co., Jackson, Mich.; Wordy Self-Starter Co., Chicago; Manzel Bros. Co.,



Reagan primer, showing pump on dash

Buffalo, N. Y.; Geisler Bros. Storage Battery Co., New York; Blessed Mfg. Co., Detroit, Mich., and the Pneumatic Clutch Motor Co., Los Angeles, Cal.

**A LAW WHICH FAILS.**—It has long been known that the law of Mariotte, according to which the volume of a gas is reduced in proportion to the pressure to which it is subjected, is not strictly correct. In the case of oxygen, the need of determining the exact amount of this gas supplied from a pressure tank for a given job of autogenous welding has brought to public attention that the deviations from the law of Mariotte become very marked as soon as a pressure of 135 kilogrammes per square centimeter is approached—which is about the initial pressure in supply tanks—the volume being in reality considerably smaller than it should be according to the manometer pressure gauge. Measurements of the gas used from such a tank, if they were based on figuring its contents from the gauge readings, would give errors averaging 6 to 7 per cent. This was confirmed at a recent contest of a number of acetylene welding apparatuses held under the auspices of the French Union de la Soudure Autogène. A series of measurements gave the first column of figures in the appended table according to Mariotte, the second column by exact weighing of the tank and its contents at the various pressures and the third column according to a curve diagram compiled from data placed at the disposal of the judges of the contest by a physicist, after extensive experiments by the latter, and serving to convert direct gauge readings into true volumes. The close correspondence between the second and third columns preclude errors in the manometer used.

Volumes according to Mariotte.	Volumes according to loss of weight.	Volumes according to corrective curve.
159.2	164.4	165
167.9	169.6	170
196	210.2	210
236.7	250.7	250
356	381	380.5

—From *Revue de la Soudure Autogène*, November.

## 1912 Car Changes and Refinements

**N**OWHERE is the trend of progress in the motor vehicle industry so well illustrated as in a consideration of the changes that have taken place during the past year in a representative group of American pleasure cars. This group may be well taken from the cars shown at the two New York shows, namely, that at the Madison Square Garden and that at the Grand Central Palace.

Outside of the adoption of what may be called the modified long-stroke motor by several of the leading builders the principal departures from former practice which may be noted are the construction of several new six-cylinder cars and the installation of self-starters on motors of either four or six cylinders.

In the way of body refinements the fore-door stands supreme. The straight line principle of body design with its suggestion of roominess and comfort has met with universal favor and has been adopted this year by nearly every builder in the field as the standard type of touring body. More luxurious upholstery has been fitted to many of the cars and accessibility of tools and tires has also been made a feature, the numerous points of adjustment and oiling being altered where necessary, so that they can be easily reached. Demountable rims have been added as regular equipment on a large number of cars.

### Improvements to be Seen in Garden Cars

#### Alco Has Two Models for 1912

There are two Alco models for 1912, the six-cylinder and the four-cylinder, to either of which any style of body is added. In the touring cars the lines have been considerably changed and the tonneaus have been made roomier, the seats tipped slightly and the cushions made thicker. Doors have also been widened. A specially new feature is the addition of small electric lamps, which are lighted automatically when the doors are opened, thus aiding in entering or alighting from the car at night. In the limousine bodies special ventilating systems have been installed to prevent drafts. These enclosed bodies are also fitted with marine windows in the back so that the driver may see what is behind him. The gearshift lever has been brought inside close to the right side and the acetylene tank has been concealed. A new body addition is the berline limousine which has the roof raised over the doors to make access to the inside easier. Window regulators are included.

#### American Remains Practically Unchanged

The additions to the line of this concern are the 22, American Scout, and 34, American roadster. These models have the feature of three-point suspension of the motor and are of the underslung type. The four cylinders on the 20 are cast monobloc. Wheels are 36 inches in diameter and fitted with 3 1-2 inch tires. The price named for this model includes full equipment, top, tires, demountable rims and generator, which holds also for the 34 model. This has four T-head cylinders cast monobloc, valves inclosed in aluminum casings and three substantial crankshaft bearings. The camshaft is spur-gear-driven in order to insure silent operation, and all parts are splash lubricated, the oil being kept in circulation by a pump. The pump housing is cast integral with the crankcase, thus obviating all connections with the latter. The clutch is an inverted cone, thermoid-faced and connected to the gear-set by a double universal joint. The rear axle is of the same construction as that of the 20 model, but the wheels are 37 inches high and have 4-inch tires.

#### The Amplex Line Has a Baby

The Amplex line for 1912, apart from the addition of the Baby Amplex, is identical with that of 1911, except for minor refinements. The upholstery is deeper, the body, with cowed hood and self-ventilating windshield, is lower and broader than last year. The running boards have been cleared and a gas tank under pressure is located in the rear. The Baby Amplex is now in course of construction and will be ready for delivery around the first of May. This new model will comprise two body types, a roadster and five-passenger touring. The model

H of 1911 is continued for 1912, but is designated as model K. Several improvements in refinements have been made upon this model that are worthy of mention. A new carbureter has been fitted for which more power is claimed, and it is provided with a means of enriching the mixture to facilitate starting, which is controllable from the steering post. The gasoline tank, heretofore located under the front seats, is now suspended from the rear end of the chassis. The self-starter itself remains unchanged except that the piping near the motor is more neatly and symmetrically arranged. A mechanism applied to the inlet pipe causes the motor to run regularly without misfiring, when running idle at low speeds. This mechanism is controlled by a lever conveniently located on the dash. Tires have been enlarged from 36 by 4 to 36 by 4 1-2 in front, and 36 by 5 rear tires now are 37 by 5 inches. Booth demountable, rims have replaced the quick detachable.

#### Atlas Makes a New Knight

The fourth company in the United States to take up the Knight sleeve-valve engine is the Atlas company, of Springfield, Mass. This company makes two models equipped with the Knight invention. The only difference between them is that one is 130 inches wheelbase while the other is 140. The first takes 36 by 4 1-2 tires and the longer car 37 by 5. The engine is four cylinders, bore 4 1-2 by stroke of 5 1-2 inches, rating at 50 horsepower. A dry-plate clutch, selective transmission giving three speeds; a shaft-worm drive, floating rear axle, and 16-inch brake drums are some of its features. The electric self-starter, it is asserted, will spin the motor at high speed for 15 minutes. It forms a part of the flywheel and has direct drive, with no gears. The gearset is mounted on the rear axle and all transmission bearings and rear axle bearings are of the extra large, heavy annular type. The gears are of chrome vanadium steel. A universal joint is used in combination with a large torsion and drag-rod tube.

#### Few Changes in the Brush

The standard Brush runabouts have not been changed beyond the fact that the upholstery has been improved with an eye towards the greater comfort of the user of the car. The Liberty-Brush, smaller edition of the Brush runabout, has been brought out this year, the only difference in the two cars being in the upholstery work and the crankcase, which is aluminum on the regular Brush and cast iron on the Liberty.

#### Buick Returns to Cone Clutch

The most apparent difference between the Buick line of 1912 and that of 1911 is the abandonment of the multiple disc clutch

and the return to the cone clutch principle in all models. In the small models, numbers 34-35, which correspond to 32-33 of last year, a three-speed selective transmission is used instead of planetary. The touring car has a slightly longer wheelbase; larger carbureter; 32-inch wheels in place of 30; and several improvements in the functioning of the engine. The chief of these is the arrangement of the rocker arms to make the valve action quieter and the installation of grease cups to improve lubrication. Both brakes are placed on the rear wheels instead of the shaft. The wheelbases of models 28 and 29 have been increased 8 and 2 inches respectively and are now 108 inches, and instead of having the motor, clutch and transmission gearset in separate units, a unit power plant now is employed. Sight feeds now are provided on the dash to show the operation of the oiling system, the fan belt is of improved design, a leather-faced cone clutch replaces the multiple-disc type previously employed. In model 43 a full floating axle has been substituted. Demountable rims are stock equipment in all the larger models and top, windshield and gas tank are included with all models.

#### Cadillac Makes Innovations

No new chassis have been added to the Cadillac line, but a self-starting plant has been installed. Some changes in a mechanical way have been made throughout the car, the principal examples of this being in the larger brakes, larger intake manifolds and valves and 36-inch wheels. By enlarging the bore of the cylinders for 1912 from 4 to 4 1/2 inches the motor now has a horsepower rating of 32.4, according to the S. A. E. formula, which is an increase of almost 8 horsepower over the motor used in the Cadillac cars for 1911. The equipment includes an 80-ampere-hour dynamo for lighting the car and operating the self-starting system and supplying the current for the ignition, which is of the Delco distributor type.

#### Cartercar Lengthens Motor Stroke

On the Cartercar the changes are few, the greatest being that of the addition of a self-starting mechanism. Model R has a motor with cylinder measurements of 4 1/8 by 4 3/4, larger valves, which are inclosed, and is equipped with top, windshield, speedometer and self-starter. This model is made in three body types. Model S, seven-passenger car, has all the equipment as above and in addition demountable rims all around. The motor of model S is 4 1/2 by 5 1/4 inches, with valves inclosed.

#### Case Adds a 40 to Its Line

The new feature of the Case line for 1912 is a 40-horsepower car known as the Greater Case 40, with a four-cylinder motor measuring 4 1/2 by 5 1/4; wheelbase, 120 inches; wheels, 36 inches; floating rear axle; pneumatic self-starter; demountable rims; and combination oil and electric lamps.

Among the notable changes in Case construction a new type of Remy magneto is used in the ignition system; a Stromberg carbureter has been fitted; the cellular type of radiator is improved; roller pushrods are fitted and the valves are incased; there is an increase in piston displacement; a magnetic oil indicator is fitted to the dash; a gravity gasoline tank is provided for hill-climbing; a gasoline gauge is fitted at the top of the tank, and a gasoline shutoff valve is provided, which may be regulated from the seat.

The clearance of the Case cars has been increased to 11 inches and the wheelbase has been increased to 120 inches.

#### Chalmers Joins the Six-Cylinderites

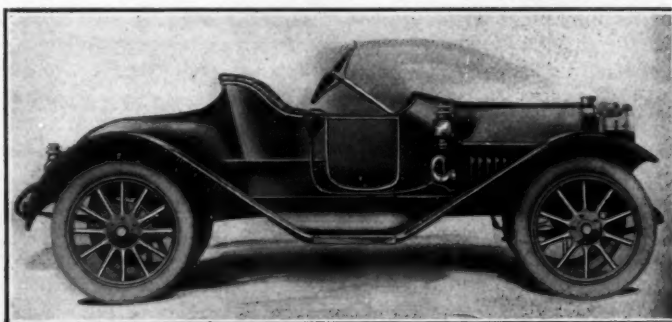
The Chalmers company has this year joined the six-cylinder contingent besides adding two complete lines of cars to its models. One set is mounted on a chassis equipped with a six-cylinder motor and known as model 12, the other being fitted to an entirely new chassis known as the Chalmers 36. The six-cylinder motor has a bore of 4 1/4 inches and a stroke of 5 1/4 inches. This gives a rating of 43.8 horsepower, S. A. E. The equipment of the six-cylinder car will include demountable rims and a dash adjustment for the carbureter, as well as a self-

starter, if desired by the purchaser. A mechanical feature of this car will be the four-speed and reverse gearset, which is an innovation for the Chalmers company since their cars were all fitted with three-speed gearsets during the past year. One of the most important features of the new six-cylinder car is that there is such a marked similarity between it and the four-cylinder model 36 that but few new machine tools, jigs or dies are required in its production. It is just as well equipped as the six-cylinder car in all respects, being fitted with demountable rims and dash carbureter adjustment, with the self-starter as an option. Among the mechanical details of the new model 36 are: New piston ring, which eliminates motor smoking; an unusually large camshaft; and push-rod tappets of extreme size; unusually heavy rocker arms; and a new crankcase construction which protects the upper parts of the motor from road dirt.

#### Columbia-Knight Heads 1912 Line

The most marked difference in the 1912 Columbia line is the adoption of the Knight type of sleeve-valve motor for one model of 38 horsepower. It has 4 7/8-inch bore, 5.5-inch stroke and is mounted on a chassis with 120-inch wheelbase and specially intended for six and seven-passenger bodies.

The cylinder heads are separate castings and are completely waterjacketed, there being transfer pipes to conduct the water from the jacket space surrounding the wall to the jacket space of the head. The operation of the sleeves is accomplished by an eccentric shaft driven by silent chain from the crankshaft.



The Oakland runabout proposition for 1912 has a racy look

These sleeves have a stroke of 1 1/8 inches, thereby giving a travel of 93 feet per minute. The sleeves are set to reciprocate so that one is approximately 70 degrees in advance of the other.

Another new Columbia model, also 38 horsepower, with T-head cylinders provided with poppet valves on opposite sides, is also included in the 1912 line. This also is built in a chassis intended for a seven-passenger body. In this body the change-speed and emergency-brake levers are in the center of the floorboard for left-hand operation. On the motor is located a power-driven pump for inflating the tires, and it also maintains pressure on the gasoline tank carried beneath the rear of the chassis.

#### Corbin Line Practically Unchanged

The two 1911 Corbin models have been continued this year with very few changes. Each is a characteristic type, but the two are radically different. The 30 uses a unit motor and gearset, the unity being established by a continuous lower casting for the two parts. Another characteristic is that the camshaft with the tappets is carried in a separate housing which bolts to the side of the crankcase.

On the Corbin 40 is a conventional design with twin-cylinder castings of T-design, the stroke-bore ratio being 1.5 to 1. In this model the motor and gearset constitute a separate unit; the rear axle housing is a steel stamping and the differential with its pinion and shaft is carried as a unit in the axle housing.

#### Elmore Adds Accessories

The Elmore cars have an arrangement of the distributor by which each pair of cylinders is served independently, to facili-

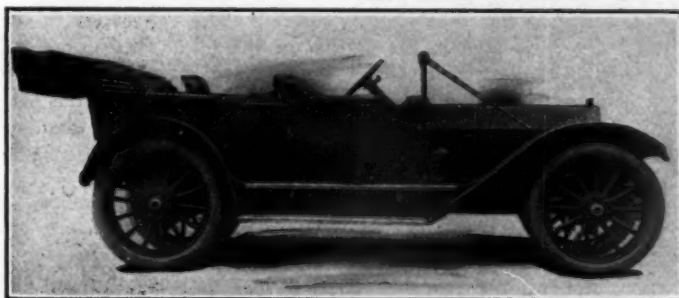
tate throttling down to low speed. Full floating axles are used on the larger cars and semi-floating in the others. The gas distributor is driven by a silent chain from the crankshaft instead of by gears as in previous practice. The distributor gate, which has heretofore been placed horizontally along the distributor shaft, for the coming season is vertical in order to prevent any chance of binding. Like the distributor shaft, the magneto is driven by a silent chain instead of gears and appears this year on the right side of the motor instead of on the left side as formerly. There has been a radical change in the clutch, which this year is of the expanding-band type operating in oil instead of the multiple-disk form employed in previous models. All levers are inside the body this year.

#### **E-M-F Lengthens Wheelbase**

The principal change in this year's E-M-F has been the lengthening of the wheelbase 4 inches to 112 inches. This year's cars have a dropframe, longer wheelbase, improved spring suspension and demountable rims as regular equipment. The gear-shifting and emergency-brake levers are arranged inside of the body, and the brake-control rods and levers are brought inside the chassis frame at the rear and their design and operation improved.

#### **Everitt Has New Six and Four**

To the 1912 Everitt line have been added two new models, the six-cylinder and another four-cylinder of 26 horsepower with bore of 4 inches by 4 3/4-inch stroke. The entire six cylinders



Comfort is the keynote of the Oldsmobile touring car

are cast in one block, together with the upper half of the crankcase and the inlet and exhaust manifolds. It is of the L-head type, and while the cylinder casting is very intricate, it presents a very simple appearance. The motor in the new four-cylinder model is of the same cylinder dimensions as given above for the six. Honeycomb radiators have been placed on the two new models. Their equipment includes a Disco self-starter.

Among the other 1912 refinements of the Everitt may be mentioned valves inclosed in a dust-proof case with an aluminum cover held in place with two small hand wheels; push-rods and guides of larger diameter and longer, which increases the bearing surface; motor crankshaft larger and stronger throughout; connecting rods longer, increasing the angle of pressure; and the babbitt cast into the big end of the rods instead of die-cast and fitted into them. In the oiling system the reservoir is removed from the side of the cylinder casting and placed on the left side of the lower half of the crankcase; the oil reservoir is provided with an indicator showing the oil level at all times; there is a cored passage extending from the valve side of the motor to the opposite side between the center cylinders and the inlet pipe of the carbureter is secured or flanged to this passage in a neat fashion. There are two combined breathers and fillers, one on the engine gearcase cover and one on the right-hand side at the rear of the crankcase.

A removable section in the floor board has been provided, giving access to the grease cups on the torque tube yoke; and this yoke is pivoted on hardened and ground pins operating in bronze bushings. The old model 30 has been retained, the ton-

neau having been made much roomier. New features on this model are the addition of an adjustable clutch pedal and the provision for opening of the right fore-door to admit the driver from the right side of the car.

#### **Flanders Uses Three-Speed Gearset**

The Flanders 20 has been continued for the present year and has had no changes of a radical nature incorporated in its construction. There are several improvements in the motor, however, which render its various features more accessible and increase its power. The exhaust pipe is no longer cast integral with the cylinder, but is a separate feature, as in the E-M-F motor. The inlet manifold also is slightly changed so that the carbureter is brought back a little to make room for the magneto, which now occupies a more accessible position just to the rear of the front motor support. This change has necessitated the removal of the water pump to the front of the front cross support of the motor on the left, where it, too, is more accessible. Instead of a cast-iron crankcase an aluminum one is now employed and the oil reservoir is cast integral with it. The steering mechanism has been changed to an improved worm and sector design.

A rubber band has been inserted in the periphery of the clutch under the center of the clutch leather to promote smooth engagement. The transmission gearset is redesigned, converting it into a selective type of three forward speeds instead of a progressive design of two forward speeds. Brakes have been rendered more efficient by changing from the two internal expanding shoes arranged side by side to an internal and external design. Fore-doors have been added to all the models with the idea of bringing the body construction up to date.

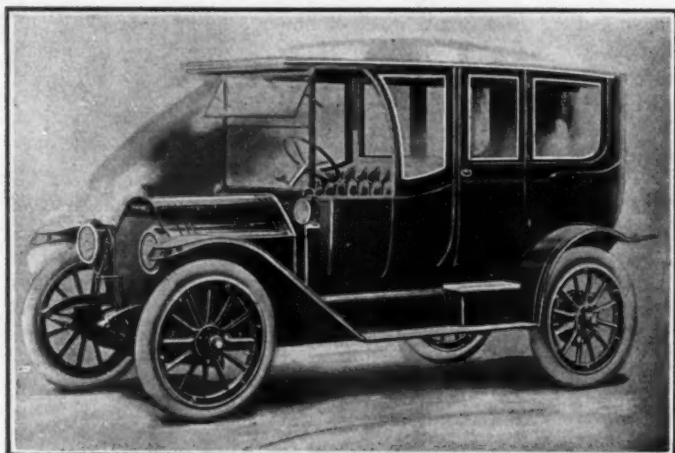
#### **Franklin Quits Auxiliary Exhaust**

The omission of the auxiliary exhaust marks the greatest change in the Franklin air-cooled line for the coming season. This port, through which 70 per cent. of the exhaust gases formerly passed, has been dispensed with in order to cut down the manifold complications which were directly due to its use. A new oiling system has been installed in place of the Hancock force-feed oiler, which was in use during the past year. The system now used is also of the force-feed type, but is of a recirculating type. A change in conjunction with the valves, which are located in the cylinder heads, is that they set directly in the cylinder head and are not held in cages as formerly. On the ignition a governor is used to care for the timing of the magneto spark on all but the smallest model, which is built with a fixed spark. The five Franklin models maintain the square motor. Another detail is that the bore of model H, which was 4.5 inches in 1911, has been reduced to 4 inches for the coming season. A new Franklin car has found its way to the market this year. It is a six-cylinder product and is rated at 40 horsepower, having a bore of 3.5-8 inches and a stroke of 4 inches. It is known as model M. All models are of the fore-door type.

#### **Garford Brings Out a Six**

The leader of the Garford 1912 line is a six-cylinder model, the motor of which is cast in two sets of three cylinders each. The measurements are 4 1/4 by 5 1/4 inches, giving an S. A. E. rating of over 43 horsepower. The engine is of the L-head type with double-point Bosch ignition. By casting the cylinders in threes instead of singly or in pairs it has been found possible to reduce the size and weight of the crankshaft and to increase the oiling facilities as well as water circulation. The car has a wheelbase of 135 inches. A dash adjustment for the carbureter has been designed. The four-cylinder models have en bloc motors; wheels, 34 by 4 1/2 inches; wheelbase, 118 inches.

Another new model, G 12, a four-cylinder of 34 horsepower, is also included in the 1912 line. The new Garford 30 greatly resembles the 30-horsepower model manufactured by the Garford company two years ago, and resembles the model 40 of 1911 and 1912, except that its cylinders are cast en bloc; and the dimensions are smaller throughout.



The Haynes 60-horsepower Model 21 touring car

#### Haynes Embodies Refinements

Model 21, which is the feature of this year's product of the Haynes company, embodies several refinements on the model 20 of the previous year. It has been made larger in every way, the bore being 4 1-2 and the stroke 5 1-2, while the wheelbase is lengthened to 120 inches as against 114 inches on the model 20. Various mechanical refinements have also been made on the motor with a view of making everything as accessible as possible. The magneto is mounted in a higher position and gauges fitted on the gasoline tank. The braking surface has also been markedly increased, the drums having been made 2 1-2 inches in width as compared to 2 inches last year. By carrying the radiator 2 inches lower than formerly and by dropping the body slightly there has been considerable lowering of the center of gravity and the car appearance has been improved thereby. The intake manifold was T form and it has been changed to a Y. The oil pump last year was located between the base of the crankcase on the flywheel, but now the case has been extended rearward and the oil pump is carried on the side of the case beneath the motor arm. Last year the fan pulley on the forward end of the pump and magneto shaft was in front of the timing-gear housing. This year it is back of the timing-gear housing, and the fan is now carried on a lever on the front cylinder casting. The size of the wheels has been increased from 34 inches to 36 inches, while the steering post has been mounted on Timken roller bearings. A fitting which is placed on the motor this year is a shelf on which any make of magneto generator may be fitted by merely drilling the required holes to hold it in place. The steering wheel has been changed from an 18-inch mahogany wheel on an aluminum spider to a solid rubber wheel of the same size.

#### Few Changes in Hudson Chassis

Changes made on the Hudson for 1912 are chiefly in the line of refinements, but in a few cases relate to some important units. Thus the wheelbase has been lengthened 1 inch to 115 inches; the compression of the motor has been increased by about 10 pounds, the change-speed gearset and rear axle are of heavier construction and the length of the clutch lever is adjustable to suit the driver. The valve tappets are increased in diameter to give a greater life and quieter operation; the valve-spring pressure has been reduced so as to lessen wear and noise in valve operation. The oil filler pipe has been taken from the left front motor arm and mounted on the right rear.

On the water pump is a large marine type grease cup used to prevent leakage of water through the cup. The radiator, instead of being direct from the cross member of the frame, rests on leather pads and is attached direct to the side frame member and it has a drain plug placed in the bottom of the tank. The cylinder casting has been changed so that the intake manifold is not waterjacketed and is made of greater length, thereby giving a lower support for the carbureter. In the clutch the

bronze driven disks with cork inserts have been replaced with steel stampings fitted with cork inserts. A gearset improvement is that a sump is now cast in the bottom of the case and is intended to receive any sediments or chips that might accumulate. A drain plug is provided in the sump. The equipment contains, among other things, the Disco self-starter, which is part of the stock product, and draws upon the acetylene tank to start the engine in any weather. The cross section of the tires has been increased from 3 1-2 to 4 inches. The toolbox is now placed in an accessible position on the running board, as is the reserve tire bracket; and another bracket of original construction holds down the top when folded.

#### Inter-State Develops a 50

The Inter-State 50, with some new refinements, is the feature of the 1912 line put out by the Inter-State Automobile Company. This car is equipped with a four-cylinder motor, measuring 5 by 6 inches, of the T-head type. The cylinders are cast in pairs, but in other respects the car corresponds with the rest of the line. The wheelbase is 124 inches and the wheels take 36 by 4 tires. The selective transmission gives four forward speeds. Double high-tension ignition is used with a U. & H. magneto. The 40 of last year is succeeded by a car with a motor 4 1-2 by 5 1-2 of the L-head type. The four cylinders are cast en bloc instead of in pairs. There are no external manifolds, these being cast integral with the cylinders. Valve springs and push rods are inclosed and the valves are interchangeable. Cooling is maintained by means of a centrifugal pump operated by spiral gears.

Lubrication has been slightly altered. The spiral-gear-driven oil pump is located in the bottom of the oil pan and provided with a distributor gear which supplies each bearing by an independent line. Last year the pump was placed on the side of the crankcase. The ignition of the motor has been changed to the Aplco dynamo-motor system, by which ignition, starting and lighting are obtained. A carbureter of special design is fitted and there also has been a change in the location of the clutch by which it is made a unit with the flywheel.

The gearset is a separate unit instead of being combined with the clutch as last year. A floating rear axle is employed instead of the semi-floating design and the emergency brakes are of the internal expanding type instead of external contracting as used previously. The wheels have been increased 2 inches in diameter, making them 36 by 4 inches instead of 34 by 4.

In the model 50 chassis the motor has been increased in size from 4 3-4 by 5 1-2 to 5 by 6 inches bore and stroke and the new lubricating and cooling systems employed.

#### Jackson Refines All Models

The four leading models of the Jackson 1912 line have been subjected to numerous changes from last year. Model 26 has a wheelbase of 110 inches, an increase of 10; rear springs are 8 1-2 inches longer. Model 32 is made 5 inches longer and is now 110 inches. The rear axle construction is heavier; the top of the differential case is removable; springs are heavier; a larger exhaust pipe; larger carbureter; wider tonneau. Model 42 had 8 inches added to its wheelbase, being now 118 inches. It also has a yoke suspending by long arm to the drive shaft tube; springs are 2 inches longer and the bumpers are placed inside the front springs, so that they operate against the axle instead of the base of the springs. The body is lower and wider and is equipped with fore-doors. Top, windshield and gas tank are regular equipment with models 42 and 52. Model 52, with a wheelbase lengthened from 120 to 124 inches, has 16-inch brake drums in place of 14; is fitted regularly with demountable rims. Nickel plating and black enamel have largely taken over the place formerly occupied by brass in all models. The whole Jackson line now has motors with inclosed valves; brace rods between the lamps, three-blade aluminum fans operating on plain bearings and a change has been made in the control levers so that the emergency brake is placed in front of the speed lever, giving more knee room.

### Knox Builds Long-Stroke Motor

The Knox company have continued the line of cars which have been presented for the past year and have made no radical changes. Refinements of body design have been incorporated, but otherwise the models of the past season are still continued. A feature of interest, however, is the addition of a motor of slightly higher stroke-bore ratio than any which have heretofore been put out by the Knox factory. This new chassis, which is known as the model R-45, has a bore of 5 inches and a stroke of 5 1-2 inches. The motor has four singly-cast cylinders, with integrally-cast water jackets. The cylinder heads are removable and the valves are of the flat-seated type, according to the usual Knox practice. The valves are located in the heads and are operated from a rocker arm. The lubrication of the new motor is effected in the same manner as has been the Knox custom in the past. Ignition is by two independent systems, one set of spark plugs being operated by a Bosch D-4 magneto, while the other is connected to a Columbia battery set and a four-unit Connecticut coil.

### Locomobile Bodies Beautified

With a few exceptions, there have been no changes in the Locomobile line for the season of 1912. The design of the bodies has been changed to a slight degree with the idea of beautifying the cars.

The leading change in the car is the new rear axle in which the differential housing is a one-piece steel casting and into this are pressed the alloy steel tubes which extend outward and carry the wheel hub.

Spring shackles have been fitted with grease cups and an auxiliary oil tank located under the front seat connects by a shut-off valve to the crankcase lubrication and so furnishes a supply of oil for emergencies.

### Lozier Improvements in Minor Details

Except for a few slight changes, which a strenuous and successful racing season has shown to be expedient, the 1912 Lozier models are identical with those of last year. Among the refinements attention may be called to the all-steel spiral gears, which have replaced the spur type rawhide timing gears. Instead of using exhaust pressure to force the gasoline to the carbureter a small plunger pump located just behind the left front leg of the motor and driven off the camshaft is provided. An extra brace is fitted between the top of the fan support and the front cylinder of the four-cylinder motors.

The radiator is provided with bypasses so that water is not forced out through the overflow when traveling at exceedingly high speeds. Adjustable clutch and brake pedals have been adopted. A large grease cup is attached to the left side frame member with a flexible tube to conduct the grease to the universal joint housing.

### Many Refinements in the Marmon

Numerous minor improvements mark the Marmon 32 chassis as compared with last year. A two-spark Bosch ignition system has been fitted with spark plugs carried in the valve caps. An addition to the non-splash oil system is that the pump feeds direct to the two front camshaft bearings. Greater accessibility of the valves is obtained by having the intake water pipe enter the casting horizontally instead of at an angle of 45 degrees. In this way the water pipes are higher than formerly. An air adjustment for the carbureter is now mounted on the dash. Spark and throttle levers on the steering column work on a two-segment instead of on a friction quadrant. Clutch operation has been facilitated by shortening the clutch rocker shaft and supporting it at the left end from a bracket on the cross member of the frame.

An entirely new bevel gear differential of Marmon construction is used on the rear axle. The bevel gear on the differential is simply a ring of teeth which bolts to the differential casting. This gear has been made in a ring form in order to reduce the

amount of metal in it and consequently reduce the amount of vibration in the gear when running. This has all been done with the object of getting a quieter action. A neat method is provided to adjust the pinion with reference to the differential bevel: The pinion shaft is carried in a ring which threads into the housing. The outer face of this ring is serrated and meshes with a worm, the upper end of which extends through the differential housing. By turning this worm the adjustment can be effected from the outside.

There is now a support for the steering column at the dash: a race of Shaefer ball bearings in the top of the steering yoke carries the car load; a hardened pin is used to secure the end of the tierod to the steering arm, the eye hole in the arm being bushed; and the end of the tierod is threaded and clamped for adjustment. Brake drums are increased in size and adjustable stops fitted to regulate brake operation.

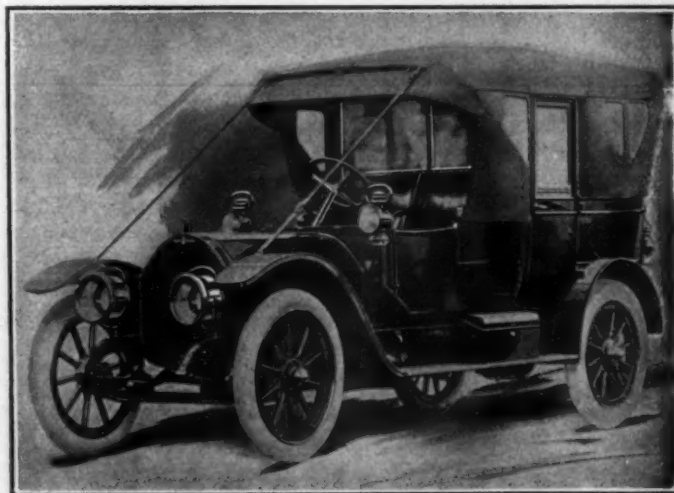
### Marquette Just Brought Out

The Marquette car has been introduced by a combination of the Rainier and Welch Detroit companies. There are two models of the car, one having a 5-inch stroke and a 5-inch bore, the other having the same bore, but being slightly longer in stroke this dimension being 5 1-4 inches. The smaller model of chassis to which there are four types of bodies under the name of models 22, 24, 25 and 27 respectively, are of the two-passenger runabout, four-passenger touring, five-passenger touring and seven-passenger touring types. The motor is of the four-cylinder type and is rated at 40 horsepower. It has a cone clutch of 16 inches diameter and a three-speed and reverse gearset of special heat-treated chrome nickel steel. The rear axle is of the floating type and runs on ball bearings throughout. The wheelbase of this car is 122 inches and the tread is 56 1-2 inches standard, but there is an option of 60-inch tread if desired, for Southern customers. The same size of tires are used on both front and rear wheels instead of larger tires in the rear as employed last year. This, combined with the demountable rims, makes tire changes easier.

The larger motor, model 28, differs from the smaller mainly in its increased size, the horsepower being rated at 45. The details of construction of the two chassis are similar except that in the larger model the gearset furnished is of the four-speed and reverse type. Splitdorf ignition is used and the clutch has been changed from multiple disk to cone with spring inserts. The gearset has been redesigned with a view to accessibility and it is now possible to remove it from the car without disturbing the body.

### Matheson Introduces Series C

New body design with flush panels, lower seats, additional storage for luggage and numerous other refinements is one of the features of the Matheson 1912 cars. The hood is of sheet



Matheson touring landaulet is a model of comfort

aluminum; fenders of sheet aluminum; running boards 1 inch wider and 11-2 inches lower and cleared from end to end. Springs are of silico-manganese steel; ignition is by the Bosch two-independent system, firing one set of plugs by magneto and the other by battery. The cars take 36 by 4 1-2 or 37 by 5 tires all around. The steering column is 17-8 inches in diameter and the control levers are inclosed in an aluminum housing in the center of the driver's well. The dash is cleared of everything but independent coil, gas pressure and oil gauges and the compression release lever. The rear axle and transmission housing is increased in size and made stronger and the transmission is separated from the differential gears.

#### Maxwell Special Feature of 1912

The Glidden Tour winner is the feature of the Maxwell line for 1912. This model, known as the Special, is entirely new. The motor is rated at 36 horsepower and is 4 1-4 by 5 1-4 inches, a bore-stroke ratio of 1.23 to 1; self-contained oiler of the horizontal trough type; Columbia radiator and hood; Stromberg carbureter; Bosch ignition; 51-inch springs; 14-inch brake drums; full floating axle in the rear and drop-forged I-beam in front; 17-inch steering wheel and 8 1-2-inch cushions are other features. The wheelbase measures 114 inches, tires are on quick detachable rims, and the equipment includes gas headlights with generator, oil, dash and tail lamps, horn, robe rail, etc.

The Mercury model has an adaptation of the trough oiler; Bosch ignition and an adequate luggage carrier for a runabout. The Mascot model, which is practically a continuation of model I, has its reservoir cast integral with the motor, is lubricated by self-contained rotary splash system, and, like the other two models, has the new radiator and hood design, a ventilated fore-door body with control levers inside and irreversible worm-and-sector steering-gear springs of special English steel. The roadster of this model has an attractive body of French design. The Messenger, in roadster body, is a development of the old AB model.

#### McIntyre Increases Length of Stroke

The changes in the McIntyre chassis for 1912 are of considerable importance. Model F 12, which is almost a counterpart of last year's A5, has had its stroke increased from 4 1-2 to 5 inches. The thermo-siphon cooling system of the motor has been displaced by a forced circulating system having a centrifugal pump. A Briggs magneto is the feature of the dual ignition system. The wheelbase has been increased from 110 to 114 inches; tires are increased from 32 by 3 to 34 by 3 1-2 inches and fitted on demountable rims.

#### Mercer Makes Many Mechanical Modifications

Mechanical changes of note mark the new line of Mercer cars for this season. The touring cars are fitted with a four-speed and reverse gearset in place of the three-speed type that was a feature of last year's line. The direct drive is on third speed with the new gearsets. The motors on the chassis to which the touring bodies are fitted have had their diameter increased by

1-8 inch. This gives a bore of 4 1-2 inches and a stroke of 5 inches. The bore and stroke of the runabout models remain the same, the bore being 4 3-8 inches, while the stroke is 5 inches. The touring car also differs from the roadster in that it has a four-speed gearset, which is something new with the Mercer. The clearance has been increased 1 1-2 inches. The wheel-base on the touring car has been increased from 115 to 118 inches. A transmission brake, having shoes which are faced with cast iron and thermoid, has been fitted to the new cars. Demountable rims are now fitted as a regular part of the equipment of the Mercer cars and the ignition is effected by Bosch two-point magneto with two sets of spark plugs on the touring models and one set on the runabouts.

#### Mitchell Adopts New Style Motor

All 1912 Mitchell cars are equipped with a motor differing from that used in previous models. The old valve-in-the-head style has been abandoned, being superseded by an L-head type. Whereas formerly the motors in all cars were of the same size, for this year there will be two sizes. On all models except the six-cylinder ones, the motors are 33-4 inches by 5 1-2 inches, while the sixes have engines with dimensions of 4 1-2 inches by 5 inches. Models which are brought out for the first time are the 28-horsepower four-cylinder runabout, the 48-horsepower six-cylinder runabout, the 48-horsepower six-cylinder five-passenger touring car and the 60-horsepower seven-passenger six-cylinder touring car. New body types are in evidence on all cars, the runabouts being equipped with fore-doors for this year. The control levers are also in the center on all models. The five-passenger four-cylinder model of last season is continued—the only valves-in-the-head motor in the entire line.

The three new motors are the same in general design, the only difference being in the size and number of cylinders employed. Models 2-four and 4-four have the same motor whose four cylinders are 33-4-inch bore by 5 1-2-inch stroke, making it a comparatively long-stroke motor with a ratio of nearly 1.50 to 1. A new magneto coupling is used, so arranged that the armature setting of the magneto may be easily adjusted.

The chassis as a whole is of the two-unit type instead of the three-unit type used last year. The power unit consists of motor and clutch suspended at three points, the two rear points of suspension being bolted to the frame directly in front of the clutch and supported upon a pivot in front. The gearset and rear axle comprise the other unit. There has been a change making for greater accessibility in the clutch, where three coil springs are used with adjusting nuts outside of the springs instead of one with the adjustment inside.

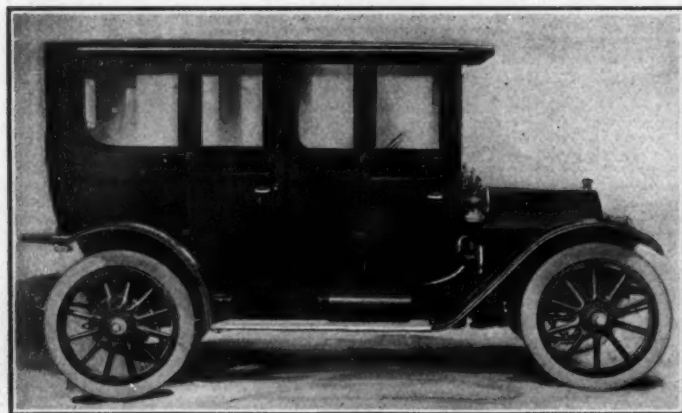
The axle is of the floating type instead of semi-floating and a new arrangement of the differential housing allows adjustment of the driving gear through caps on each side of the differential. The Elliott design of front axle has been adopted for 1912 so that the tie-rod is at the rear instead of in front of the axle.

The 2-four has a wheelbase of 100 inches and 32 by 3 1-2-inch tires. The 4-four is the same chassis except for the wheelbase, which is 115 inches. The 5-six and 2-six have six cylinders of the same size as the foregoing models, but with the gearset amidships instead of on the rear axle and a wheelbase of 125 inches with 36 by 4-inch tires. The model 7-six, upon which is fitted the seven-passenger touring body, has a six-cylinder motor of 4 1-2 by 5-inch bore and stroke with a wheelbase of 135 inches.

#### Moline Continues Long Stroke

The Moline factory has not made very many changes of note, the chief departure includes an increase in the size of the water circulating pipes and in the design of the radiators from the vertical round-tube type to the flat-tube type. Pushrods and valve stems are enclosed for quietness, and grease cups are now attached to spring shackle bolts.

Prest-O-Lite self-starting device and dash adjustment for the Schebler carbureter have been added to standard equipment. Tires have been increased from 36 1-2 by 3 1-2 to 36 by 4 inches.



Chalmers 36 Berline limousine

### Moon Introduces a New 40

The current feature of the Moon line is a 40-horsepower automobile which has been added for 1912. All the other models are continued with a few changes. The new car has a wheelbase of 120 inches; motor, 4 1-2 by 5, of the T-head type; full-floating rear axle of a new one-piece style. The transmission is suspended on the main frame by four arms; bearings are imported; Disco self-starter; control levers inside; body lower hung; nickel trim. Demountable rims, gas tank and combination oil and electric lamps are standard equipment. The springs are 4 inches longer in front and 6 inches longer in the rear. The 30-horsepower car has slightly larger motor (4 1-2 by 5 instead of 4 3-8 by 5), a wheelbase lengthened from 114 to 116 inches and takes 34 by 4 tires in place of 33 by 3 1-2.

### National Adopts a Left-Hand Drive

A new long-stroke motor, left-hand drive and center control, demountable rims, self-starter and electric lights are the new features of the National automobiles for 1912. The bodies are built lower and 10-inch upholstery is used in the seats. The new engine, which has a 4 7-8-inch bore and 6-inch stroke will be incorporated in two body styles, one a roadster and the other a touring car, which, however, do not differ in detail from the well-known National 40 with the 5 by 5 11-16-inch motor. The newcomer greatly resembles the 40 except that its wheelbase is longer, the measurement being 128 inches, whereas the 40 is 124.

### Oakland Makes Many Changes

Among the important changes incorporated in the Oakland cars for this year, the most radical, those in body designs, deserve special notice. Unit-power plants and three-point suspension are used in all models except one. The cone clutch has been replaced by a multiple-disk clutch and the gearshift lever located on the inside providing right-hand control. Sight feeds are fitted on the dashboards and the fore-door type of body is used on all chassis. The stroke of the 4 1-2 by 5 motor has been lengthened to 5 1-4 inches and an entirely new motor having a bore of 4 1-8 inches and a stroke of 4 3-4 inches has been added. Features of the new model worth accentuating are the inclined position of the unit power plant in the frame, insuring straight-line drive; the propeller shaft inclosed in a torque tube which is reinforced by diagonal radius rods; adjustable driving gear bearings in the rear axle; brake rods arranged inside the frame; and control levers inside the body.

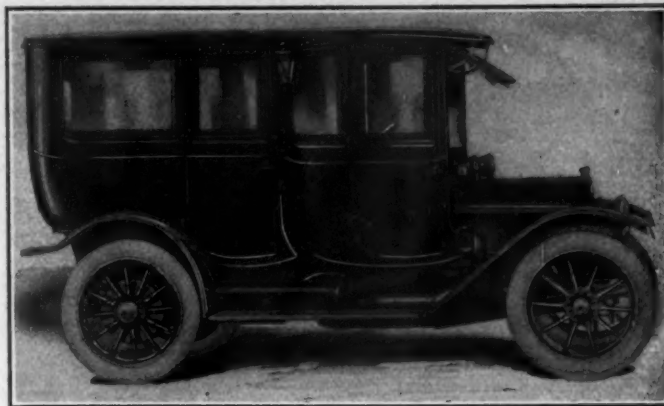
The sociable roadster which has been brought out by the Oakland company is an innovation worthy of note in that it allows three persons to be seated comfortably side by side, having a seat 46 inches in width.

### Ohio Adds Electric Lights

The standard 112 Ohio chassis is almost identical with that of 1911 except that the motor has a bore and stroke of 4 1/2 by 4 3/4 inches, a Bosch dual magneto, and the wheels are increased from 34 to 36 inches in diameter and equipped with quick demountable detachable rims. By increasing the cylinder dimensions, which previously were 4 by 4 1/2 inches, the motor is claimed to be increased in power from 33 to 40 horsepower.

The only change of note in the Ohio cars is that an electric-lighting system has been added to the equipment. On the standard chassis any one of four body types is constructed. These bodies are the raceabout, the roadster, the four-passenger touring car and the five-passenger touring car. The four-cylinder motor, with a bore of 4 1/2 inches and a stroke of 4 3/4 inches and with unit power plant and three-point suspension, remains practically unchanged.

The new speedster model is similar to the standard model in design, but the motor has a 4 15/16-inch bore and 4 3/4-inch stroke; it is equipped with a double distributor magneto, has an additional hand oil pump and auxiliary oil supply tank; the wheelbase is 105 inches; tires are 32 by 4 and mounted on racing rims, and the rear springs are 43 inches long and 2 1/4 inches wide.



Cadillac 1912 limousine shows trim lines

### Refinements Mark 1912 Oldsmobiles

Oldsmobile models for 1912 have undergone but few changes, these being in the line of refinements and weight reduction. For instance, the weight of the Autocrat cars has been reduced by from 350 to 400 pounds, by utilizing aluminum casings for the various units, such as transmission housing, basechamber and so on, while the clutch and the transmission have been reduced in size. The motor has been fitted with a compression release operated by cams on the exhaust camshaft by which the exhaust valves are raised slightly from their seat to relieve compression in starting.

The changes in body designs apply to all models and consist of fitting ventilators to the fore-doors and finishing caps on the hubs by which the hub caps are made to extend above the base of the spokes to cover the bolts. In addition to wiring the bodies for electric lighting, an automatic gas-lighting system is installed, the control valve of which is a needle valve to prevent leaks in place of the usual shut-off cock. The tourabout body has a cast aluminum dash into which these lamps are sunk. An addition to the line of the company is the Defender series, constructed along similar lines to the successful Autocar. The Defender type takes the place of the Oldsmobile Special, which has been discontinued, to make room for a type more remote in price from the Autocrat class than were the Specials. The Defender has a four-cylinder motor of long stroke, the dimensions being 4-inches bore and 6-inches stroke, a stroke-bore ratio of 1 1/2 to 1. The wheelbase is 116 inches with 36 by 4-inch tires. In all other respects the chassis corresponds with the other two models.

### Minor Refinements in Overland Chassis

On all four models of the Overland—58, 59, 60 and 61—fore-door bodies are used with the steering column on the right side, but the emergency brake lever and change-speed lever are in the center of the floor boards to be operated with the left hand. All four chassis are four-cylinder types with the gearset and rear axle a unit. The aluminum intake and return water pipes have been increased in efficiency from 25 to 75 per cent. Using separate cylinder castings permits of the regular use of five-bearing crankshafts in all models. A motor improvement in Model 58 is inclosing the exposed ends of the valve tappets and valve stems. This has been done by a cylindrical covering formed in halves, and these held together by spring clamps. An important valve improvement is a packing at the lower end of the valve stem guides. This packing is contained in the coned end of the guide and is held in place by a steel washer which is in turn supported by a spring surrounding the valve stem. In order to prevent oil leaking out from the upper ends of the tappet guides, due to the pumping action of the tappet in its bushing, two vertical oil return grooves are cut in the bushing, and at the top of these grooves is an annular space surrounding the tappet. The oil lifted by the tappet collects in these grooves and flows downward.

Wheels have been made heavier on all models. On Model 61 a new form of gear-shift is employed which eliminates the side movement of the lever, an important feature where these levers are placed between the passengers in the front seat.

#### Packard Six Features That Line

The six-cylinder Packard car which was put on the market in the middle of the summer is being produced in conjunction with the Models 18 and 30, which have been the Packard mainstay for years. The six incorporates many new features of design in the motor. It uses twin-cast cylinders with opposite valves, but employs a three-point suspension, a trunnion in front and rigid supports on the side frame members at the rear. Instead of the three-part Packard crankcase there is a two-part casting which is continued rearward and entirely incloses the dry-disk clutch and flywheel and it is continued further to the rear, forming a bearing for the rear end of the clutch shaft. The motor differs from previous Packard types in that it uses a non-splash circulating oiling system and a gear pump delivers this oil to the four crankshaft bearings, to the two front camshaft bearings and to the magneto shaft bearings. By drilling the crankshaft oil is led to the six lower connecting rod bearings. A 5-gallon auxiliary oil tank is carried on the left side of the crankcase and feeds by a vacuum flow into the case.

The adoption of the Bosch high-tension dual outfit marks the only change in the ignition system. The rear axle is made as a unit with the gearset, but differs in construction in that the gearbox is a detachable unit and the differential housing a one-piece oval-shaped casting.

The most important change in the four-cylinder car is that the crankcase construction is identical with that in the six, namely, incorporating the flywheel and clutch. Three lengths of wheel-bases are employed on all three models—114 inches, 123.5 inches and 129.5 inches.

#### Palmer-Singer's New Brighton Model

The Palmer & Singer Manufacturing Company is placing on the market a new little-six, called the Brighton. This car differs from the former 40-horsepower model made by the company in that the cylinder measurements are 4 by 5 inches as compared with 4 by 4¾. The cylinders are cast in blocks of three and have valves 1⅞ by 5/16 inches. Lubrication is by splash, the supply being shown by means of a visible oil indicator which is integral with the motor. There is a large centrifugal water pump and a belt-driven fan. There are two independent sets of brakes of the internal expanding type, both located on the rear axle. The spark and gasoline control parts are fitted with universal points throughout. A gasoline pressure system is fitted, all pipe connections being solderless and the tank having a capacity of 23 gallons. The transmission is of the three-speed type, whereas in the older 6-40 model there were four forward speeds. The weight of the car has been reduced to 3,000 pounds, or 500 pounds less than its predecessor.

#### Peerless Brings Out Two New Chassis

The Peerless factory has brought out two new chassis for the season of 1912. The smaller of the two is fitted with a motor of 4½-inch bore and 6-inch stroke, while the larger has a bore of 5 inches and a stroke of 7 inches. The two new chassis are rated at 38 and 40 horsepower. All of the new six-cylinder motors have seven instead of four main bearings, which are strapped in a conventional manner to the upper half of a horizontally-split crankcase, the lower portion of the case simply acting as an oil pan for the splash lubrication employed. The motor is suspended direct from the side members of the main frame by two I-beam drop forged cross-members, while the gearset rests on an individual sub-frame suspended from two heavy channel steel cross-members arranged amidships of the main frame.

Another new feature of the six-cylinder models is that at a nominal extra charge the car can be made for left-hand drive instead of the conventional right-hand. To make this possible

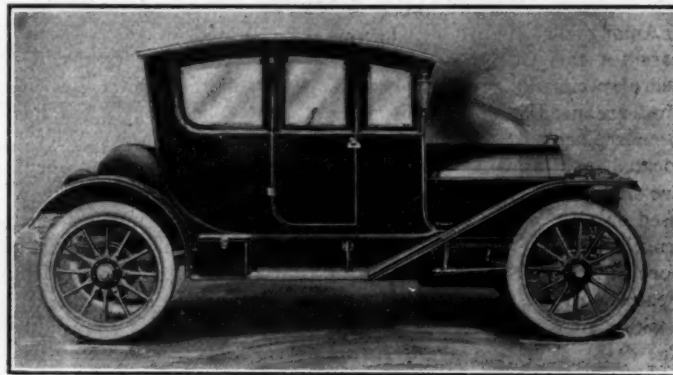
the oiler no longer is cast integral with the crankcase of the motor, but is a separate unit with the crankcase adapted for its attachment on either side. The Bosch double-synchronized ignition system has been adopted.

About 33 per cent. of the chrome tan leather facing of the expanding clutch is occupied by cork inserts; the brake control shaft now crosses the top of the change gearcase, necessitating slight changes in the shape of the removable inspection plate; improvements have been made in the spring design by increasing the number of leaves and making them thinner so that now they are slower acting and more shock absorbing; in the six-cylinder 60-horsepower car the valves have been increased from 1 7/8 to 2 1/4 inches in diameter.

#### Body Changes Mark the Pierce-Arrow

The three models of the Pierce-Arrow are continued this year—Six-36, Six-48 and Six-66. The motors in the first two have not been changed, but in the 66 the measurements are 5 by 7 instead of 5.25 by 5.5 of 1911. This gives a long-stroke motor, the stroke-bore ratio being 1.4 to 1.

All three chassis are equipped with bodies which differ radically from last year. They are all fore-door flush-side creations with change-speed and emergency brake levers inside the body. In order to get these inside, the body at this point had to be widened, which was accomplished by overhanging the body sills on the frame members. This was accomplished by



The National Coupé presents an attractive appearance

placing extension plates on the frame at this point, these plates supporting the body sills. The use of fore-door bodies necessitated ventilators which take the form of hinged doors in the baseboard of the windshield. An addition to the oiling system is a special lead to the timing gear housing of the motor and also to the front end of the magneto shaft.

To meet the demand for electric lighting, four bosses have been provided on the left rear of the crankcase to which a support for an electric generator can be attached. Provision is also made to drive this through a clutch coupling with the rear end of the pump shaft. Starting is facilitated by the priming equipment by which, by means of a pump on the dash, gasoline is sprayed into the manifold through a special nozzle. Gear-shifting has been facilitated by the addition of two disk-shaped clutch brakes which bear upon the face of the cone clutch when it is drawn rearward for disengagement.

#### Pope Makes But Few Changes

With the exception of ¾ elliptic springs in the rear, a brake on the clutch to aid in shifting gears and a phaeton body, the Pope-Hartford line for 1912 is identical with that of 1911. Seventeen different body styles are offered. Except on the roadsters, the tool box, which is of new design, is attached to the rear part of the body within easy reach. This tool box forms, in effect, a part of the body. The mudguards and running boards have been widened to afford better protection to the car body, and the inner sides of the detachable doors and the inside casing of the front compartment have decorative panels.

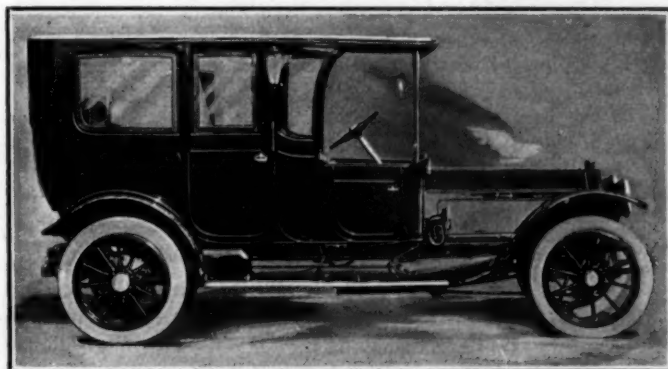
### Premier Increases Accessibility

The line of cars produced by the Premier people follows rather closely along the general style of those produced during last season. Refinements have been made, however, in certain details, among which the principal are the elimination of noise; a greater braking surface; more accessible valve mechanism; the use of spiral gears in the timing gearset, and dash air control of the carbureter. Demountable rims are also included in the equipment of the new cars.

There also is a change in the steering gear, the end thrust now being taken up by two Timken bearings, the adjustment nut for the bearings having been elaborated for turning or locking.

### Pullman's Two New Models

A new four-cylinder and a new six-cylinder model are presented in the Pullman line for 1912. The four is known as the 4-40 and has a motor with T-head cylinders cast in pairs  $4\frac{1}{2}$  by  $5\frac{1}{2}$  inches, the valves of which are  $2\frac{1}{8}$  inches. The transmission gives four speeds. The wheelbase is 112 inches. The equipment includes the Ever-Ready self-starter, top, cover, windshield, speedometer and demountable rims. The radiator is of the square cell honeycomb type. The six-cylinder model, called the 6-60, is made by adding a pair of cylinders of the same size as those in the four-cylinder car. The wheelbase is 138 inches and the wheels take 36 by  $4\frac{1}{2}$  tires. In addition to all



Peerless 1912 six-cylinder, 48 horsepower limousine

of the above equipment, the six has an electric vulcanizer included in its list price. The model O of last year will be continued with a few alterations, the wheelbase is increased 8 inches to 118 inches and full equipment is included, except for the self-starter. On the 4-40 and the 6-60 there is a four-speed gearset and the engine valves are inclosed.

### Reo the Fifth Introduced

Under the name of Reo the Fifth, the Reo company has brought out a new car with the same size motor as that employed during the past year with 4-inch bore and  $4\frac{1}{4}$ -inch stroke and a rating of 30 horsepower. The bodies fitted with the new chassis are of the five-passenger touring, baby-tonneau and two-passenger roadster types. A 4-inch longer wheel base is put on these cars than was used on the former Reo models, and the left-hand control is also used. The gear shifter lever has a cane-shaped handle and may be readily removed and placed in the locker. A conspicuous feature of this new model is the center control. The steering wheel is on the left side, but the gear-shifting lever is in the center and so designed that the top of the handle moves only 3 inches in going from one speed to another. The emergency brake lever is done away with and the brake operated by the clutch pedal. Both brakes, therefore, are operated by the feet and can be applied whenever necessary without taking the hand from the steering wheel.

The flywheel of the motor has been set back 2 inches to reduce the vibration of the motor. Valve mechanisms have been rendered quite noiseless. Wearing surfaces have been im-

proved and a device for eliminating the noise of the camshaft timing gear has been added. A new one-piece fan is used in place of the old four-bladed one of last year. An improved adjusting device has been added and also a means whereby the fan may be readily removed. The radiator is considerably increased in capacity. The rear axle has been entirely redesigned, the shafts being of nickel steel and of larger diameter than those of last year; the differential gear having four pinions instead of three, whose teeth are much heavier than those of the old type; the driving pinion is made integral with the shaft; and a great deal of attention has been given to securing quiet gears for this axle. An important change in the transmission mechanism is the elimination of the torsion tube that inclosed the propeller shaft and the adoption of an exposed propeller shaft with two universal joints.

### Selden Featured by Single Chassis

The Selden line of cars for this season is featured by a single chassis of the same type as last year. The motor employed is of the same size and no changes of important details are marked, the chief difference being the adoption of a dry-plate multiple-disk clutch in place of the cone type used last year. This clutch is inclosed in a housing bolted to the flywheel. There are thirteen disks, the driving disks being faced with an asbestos composition riveted on, while the driven disks are left plain. The inner or driven housing incloses a pair of heavy spiral springs, while three studs extending through the pressure plate provide a convenient means of adjusting the tension without removing any housing or cover. An automatic spring lock secures the studs from turning. Another change is the adoption of a floating rear axle of new design in which the drive pinion shaft runs on New Departure ball bearings of high-duty type.

### S. G. V. Presents Another Model

There are no yearly models evolved by the S. G. V. company, but the current type of automobiles, known as Series B, differs somewhat from the preceding series in that inclosed valves have been substituted for the previous style of manufacture. Otherwise the models are identical. In addition to Series B, the company intends to show a model of Series C. This car is a duplicate of the Lancia 30-horsepower model of 1912, except that it is slightly larger as far as the motor is concerned. The Lancia 30 has cylinder measurements of 3.9 by 5.1, while the S. G. V., which is rated at 35 horsepower, has a motor 4 by 5.25.

One change noted in the 1912 product is the inclosing of the valve springs. The dash is remarkable for its cleanness, the pressure gauge being the only device located on it. There is a fixed spark and the magneto switch is located in the center of the steering wheel. The carbureter also has been made fool-proof, the designer following the foreign practice of setting it before the car leaves the factory.

### Simplex Lengthens Wheelbase

In addition to the 38, 50 and 90-horsepower Simplex 1911 models the company has put out for 1912 some slight modifications. These consist of lengthening the wheelbase of the 38 model from 127 to 137 inches to accommodate a longer body, and the 50 is made in 139-inch length. The old types, 127 inches for the 38 and 124 and 129 for the 50, are continued along the lines of last year. The lengthening of the chassis is for the purpose of accommodating a lower, longer body. The steering column is placed at an angle of 37 degrees, thus giving the opportunity to widen the doors and give the driver more room. Disco self-starters have been installed as stock equipment. The 38-horsepower chassis with its shaft-drive is offered with very few changes from the design embodied in last year's product. The most important change lies in the design of the carbureter. The single-jet type which was employed heretofore in both the chain and shaft-driven models is replaced by a multiple-jet type, although the former is still employed on the chain-driven models.

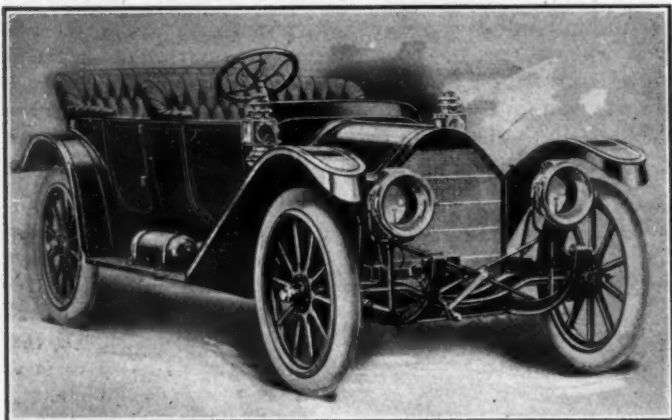
### Speedwell Has Transmission Change

The standard Speedwell chassis has been retained, and no important changes have been made in the motor. The transmission is now equipped with annular ball bearings instead of the former roller bearing construction. All gear faces, shafts and housings have been increased in size and the wheelbase has been increased from 121 inches to 123 inches. The brakes have been improved by reason of the use of a later type of Timken axle.

### Stearns Pins Its Faith to Sleeve Valve

Having entirely discontinued the manufacture of its previous poppet-valve types, the Stearns company has equipped all its models with the Knight motor as manufactured by the Daimler company in England. Only one size of motor has been marketed to date, it being 4.25-inch bore and 5.5-inch stroke, giving horsepower rating at 38.9.

The lubrication in this motor is the trough system, there being a trough between each connecting-rod and into this dips a small finger or scoop on the lower end of the connecting-rod cap. The oil pump feeds into the trough, giving a fresh supply of oil. The troughs are hinged at one end and can be raised or lowered to feed more or less oil. They also are interconnected with the throttle so that when the throttle is opened more oil is fed. The general chassis features of this Stearns car are the same as last year. Two lengths of wheelbase are used, one 120



Foreshortened view of 1912 Regal touring car

inches with touring car, limousine and landaulet, and the other 116 inches for toy tonneau and roadster.

### Refinements Mark the Stevens-Duryea

Two of the three Stevens-Duryea models of last year—X, a six-cylinder, and Y, a four-cylinder—remain practically unchanged. In the model AA six, however, quite a few changes which take the form of refinement are found. Most important is the substitution of a Bosch two-independent ignition system for the double system in use last year. In the two-independent system the magneto constitutes one source of current and the batteries another. There is mounted at the left front of the motor a timer-distributor for use in the battery system. This timer-distributor is but a combination of the make-and-break mechanism of the Bosch magneto, and also the distributor part, the former in the primary circuit and the latter in the secondary circuit. A still further change in this model is the employment of a four-cylinder gear-driven air pump for inflating the tires.

### Knight Six Features Stoddard-Dayton

In the new Stoddard-Knight six two sleeves are used which take the place of valves and which are the same as used in all of the Knight types of motors. These sleeves are located between the cylinders and pistons and are reciprocating by short connecting-rods on an eccentric shaft, which shaft is driven by silent chain from the crankshaft. A feature of this new motor is that the cylinders are cast in two groups of three each.

They have a bore of 4.5 and a stroke of 6.5 inches, which gives this motor the unique position of being one of the longest stroke Knight motors on the market in this country or abroad. It has a rating of 58 horsepower.

Although the piston has a stroke of 6.5 inches, the sleeves have a stroke of but  $1\frac{1}{4}$  inches. On the compression stroke both inner and outer sleeves move upwards with the piston, the inner sleeve moving the faster. On the explosion stroke both sleeves move downward with the piston at the point where the side thrust of the piston is greater, thereby eliminating, to a degree, such thrust. The oiling system employed is that of troughs beneath the connecting-rods into which these dip. Both sleeves are gray iron casting finished inside and outside on special grinding machines, and on the outer surfaces are oil grooves to distribute lubricant over the entire face of the sleeve.

### Six-Cylinder Thomas Much Improved

A complete new system of circulating lubrication for the motor of the 1912 six-cylinder Thomas has been added, which has called for a redesigning of the base of the crankcase in order to make room for an oil reservoir containing 3.75 gallons. In this reservoir is incorporated a sliding vane pump which delivers lubricant by a  $\frac{1}{2}$ -inch copper pipe to the timing gear housing, to the front half of the crankcase and to the rear half of the case. Within the motor a typical splash system of oiling is used, the lower ends of the connecting-rods dipping into the oil and splashing it to fill the pockets over the crankshaft bearings, as well as splashing it into the cylinders. In addition to the crankcase oil supply a novelty has been introduced by carrying a 6-gallon oil tank under the chassis at the left rear. This is a long cylindrical-shaped tank pointed at both ends.

The gasoline tank of 24 gallons capacity has been mounted on the right side of the chassis. Locating these tanks in this position has lowered the center of gravity of the car and left the space beneath the front seat for baggage-carrying facilities. Space beneath the front seat is divided, one portion for baggage and the other for carrying the storm curtains of the top.

### A Six Added to the White Line

Continuing the two four-cylinder gasoline models which it had last year, the White company has swung into the six-cylinder class this year. The six is simply an addition to the line. The motor is not of the same power as the four, but has larger cylinders— $4\frac{1}{4}$  by  $5\frac{3}{4}$ —whereas the four is  $3\frac{3}{4}$  by  $5\frac{1}{8}$ . It is the same type—an L-head—and with the cylinders cast en bloc and with both sets of valves on the right side. Lubrication is secured by means of a combination of the splash system and positive feed. In other points there is similarity. The six uses high-tension single ignition, employing the Mea magneto; uses the White carbureter, a cone clutch, four-speed gearset, shaft drive and semi-floating rear axle. The wheelbase is 132 inches, with the tires 37 by 5. The front springs are semi-elliptical and the rear three-quarter. The front axle is I-beam and the rear semi-floating. The frame is chrome nickel steel, heat-treated. A self-starter of the electric type, which is combined with a lighting system, is a feature of the White six.

### Winton Practically Same as Last Year

The lengthening of the Winton wheelbase is the principal change apparent in this well-known car. Formerly 114 inches, it is now 120 inches, the extra space being absorbed in foot room for the front-seat passengers and also additional room in the tonneau. The fore-door body is standard.

Few chassis changes are in evidence. One minor one is fitting a new coupling between the water pump and the magneto. It is a jaw-type coupling improved by the addition of a take-up device for taking care of any looseness that might develop. Another change is the use of adjustable brake and clutch pedals in which the foot piece is carried on a stub rod with serrations, which telescopes with the tubular pedal shaft, a pinching bolt holding any setting desired. Still another improvement is the use of a new universal joint in rear of the gearbox.

## New Features to be Seen in the Palace Cars

### Abbott-Detroit Adds a 44

The Abbott line still includes the 30. Some additions have been made to meet the demand for cars of larger power. These new cars are mounted on the 44 chassis. Their principal feature is the larger size of the motor, which has been increased to a bore of 4 1-2 inches and stroke of 5 1-2 inches. This gives a stroke-bore ratio of 1.22 and a piston displacement of 349.5 inches. The motor is of the L-head type, having valves with nickel-steel heads and carbon-steel stems. A horizontally divided aluminum crankcase covers the flywheel. The transmission gearset and multiple-disk clutch are enclosed in an aluminum case which is adapted to bolt onto this enlarged end of the motor crankcase and form the unit power plant. The 44 is made in touring, demi-tonneau and Berline bodies. The equipment for 1912 includes two electric headlights, combination oil and electric side and tail lights with a 180-ampere-hour storage battery. Demountable rims are also included in this year's equipment on both cars. Among other changes in the 30 for 1912 are: A 1-8-inch increase on the bore; valve tappets have been changed from the ball and socket type to the pivot-pin design, thereby increasing the wearing qualities; the crankcase-oil filler has been enlarged and provided with a patent cap; sheet metal webs extend from the motor crankcase to the side members of the frame, so that the mud-pan under the motor is eliminated; and a stronger bronze water pump replaces the die-cast metal pump previously employed.

### Auburn Adds Five-Passenger Touring Model

The Auburn line is built with four types of motor, among which a four and a six-cylinder engine are of the new long-stroke design. The motors have 4 1-8-inch bore by 5 1-5-inch stroke, cylinders cast separately and with the valves on the left side. The Bosch double ignition system is used on the 6-50 and the Remy dual type is fitted to the four-cylinder motors, but carburetion and lubrication are of the same type in both. The multiple-steel disk-clutch plates are faced with Thermoid. The transmission is a three-speed selective set, as in the other models. The 6-50 has a service brake of the internal expanding type, while the other models use contracting types for foot control. Emergency brakes are internal expanding on all cars. The six-cylinder car has a wheelbase of 135 inches and 37 by 4 1-2 tires all around. A four-cylinder motor of the same dimensions as the six is used in the 35-L, which has 116 inches wheelbase and 34 by 3 1-2-inch tires. The clutch has dry-steel plates, faced with leather. Ball bearings are being used on all shafts, while in last year's models plain bearings carried the crankshaft and roller bearings the rear axle.

Included in the 1912 line is a new five-passenger touring-car model designated 35-L. This new model is almost identical with the six-cylinder, 50-horsepower car except that the motor has but four cylinders, a leather-faced cone clutch and the wheelbase is 115 inches and smaller wheels and tires are fitted and it has a double-drop frame.

### Bergdoll Adds a 40

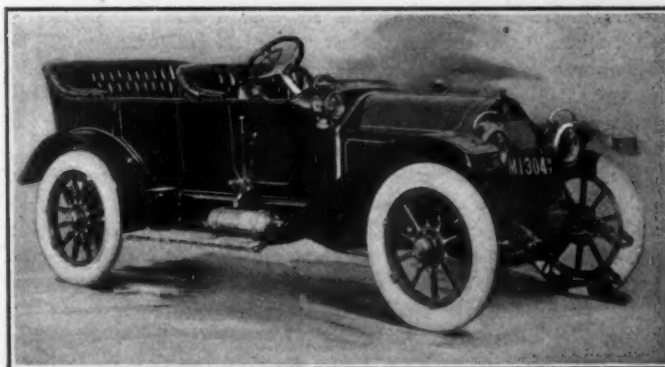
The Bergdoll 30 will be continued for this year, and in addition a 40 has been added to the line. The new car has a motor of 4-inch bore and 6-inch stroke giving a horsepower in excess of 40. The cylinders are a monobloc casting and are four in number. The clutch is of the multiple-disk type and is enclosed in a continuation of the crankcase. The gearset is of the four-speed and reverse type running upon bearings of the annular-ball type. The motor is lubricated by the splash system in the same manner as used in the previous Bergdoll models, while ignition is taken care of by a Bosch magneto of the easy-starting type. No batteries are supplied with this chassis. A self-starter of the Ever-Ready type is included in the equipment of the 40 if it is so specified by the customer.

### A Cino Six Makes Its Bow

The chief feature of The Cino line for 1912 is that it will include a new six-cylinder model and scarcely less important is the change in design of the motors from the valve-in-the-head variety to the T-head type. The one chassis model produced last year had a four-cylinder engine of 4 3-8-inch bore by 5-inch stroke with valves located in the head. This year the four-cylinder motor is of the same dimension, but is of the T-head type, with inclosed valve. The cylinders as formerly are cast in pairs and a Bosch-Eisemann magneto is supplied. Ball bearings are substituted for the plain bearings on the crankshaft and the roller bearings on the rear axle. The wheelbase has been increased 1 inch, making it 114 inches. In place of the aluminum cone clutch used last year a pressed-steel clutch is employed in which is incorporated an automatic adjusting spring. The six-cylinder model has 4 by 5-inch cylinders cast in pairs, 130-inch wheelbase and 36 by 4 1-2-inch tires. All the bodies are hung lower for this year and the back seat is 3 inches wider.

### Cole Cars to Be Electrically Lighted

All Cole cars are constructed on the one chassis, the wheelbase of which has been increased from 118 to 122 inches. The



Stutz 1912 five-passenger touring car

motor is the new Cole engine, which has a bore of 4 1-2 inches and a stroke of 5 1-4, whereas last year the size was 4 1-2 by 4 1-2. The cylinders are cast in pairs. The new equipment includes the Prest-O-Lite self-starting equipment and the Ward-Leonard dynamo electric lighting system. An entirely new roadster has been brought out for this season. It has a long hood, wide scoop body and a well-shaped cowl, from which the side lights protrude. The 1912 Cole is known as the 30-40, instead of being called a 30-horsepower car, as formerly. Timken floating axles and Timken roller bearings have been added, as well as a torsion-rod of V-shape. The adoption of the Queen Anne style of body panels and doors is noticeable. All door latches are placed inside, and the trimmings are of nickel. As in the last year's models, the lubrication is by splash, but the method differs in that it is non-circulating. Another change is the adoption of a floating rear axle of Timken design, bringing about a change in the brakes on the rear axle. Two sets of brakes are provided operating on the rear wheel drums which are 12 1-2 inches in diameter and 2 1-4 inches wide.

### Cutting Has Two New Models

Two new models have been added to the Cutting line, two have been dropped, while three are continued with some slight improvements and refinements. The two models that have been added are: the T-35, a five-passenger touring car with a 4 by 5-inch motor, and 34 by 4-inch tires; and the T-55 a five-passenger touring car with a 4 3-4 by 5 1-2-inch motor, and 36 by 4-inch tires; both have a wheelbase of 116 inches. The models that have been discontinued are the E-30 and the E-50.

both four-passenger torpedo touring cars. Model A-30 has a new motor in which the bore has been increased from 3 3-4 to 4 inches; valve operating mechanisms all are inclosed, and a pump is provided in the cooling system converting it from a thermo-syphon into a forced water circulating system. By using seven plates instead of five in the clutch, improved and easier operation is obtained in starting the car, and the gearset has been improved by mounting its shafts on ball bearings instead of the plain ones previously employed. An improved rear axle design has been adopted and the brake drums enlarged 2 inches. The levers are arranged inside the body; there is more rake to the steering column and it is longer; and there are individual pedals for the clutch and service brake instead of one pedal for both.

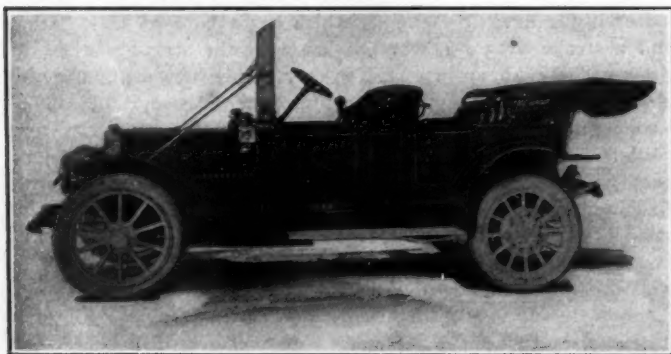
#### De Tamble Has But One Type of Motor

The De Tamble designers have changed the motor by lengthening the stroke from 4 1-2 to 5 inches, the bore remaining at 4 1-4 inches. The five models have all 116 inches wheelbase length and 34 by 4-inch tires. The motor is a unit with the transmission on all except the \$1,000 cars. Demountable rims are standard equipment. The \$1,500 car equipment includes electric lights and nickel fittings besides the usual equipment.

#### Fiat Six a New Feature

Aside from the fact that the Fiat Poughkeepsie factory is turning out a monobloc, L-head six motor with dimensions of 4 2-5 inches by 6 inches, there are no marked changes in the Fiat line. The new six is of the monobloc type, with the valves all on one side and inclosed, while the exhaust and intake manifolds are contained in the motor casing and are waterjacketed. There are but two timing gears, both of helical design, metal-to-metal, while the pump and magneto are located in the front of the engine. There is a dual system of ignition, and force-feed lubrication is employed. Other features are an internal multiple-disk clutch, a double-jet Fiat carbureter and four-speed gearset with direct on fourth.

The axle and drive shaft system is inclosed in a two-piece pressing of alloy steel and strut, torsion or brace rods are eliminated. The rear axle, of the semi-floating type, is inclined to prevent spreading of wheels. The wheelbase on the six is 135



Side view of Glide 1912 touring car

inches and the tire sizes are 36 by 4 1-2 in front and 37 by 5 in the rear. The fan on the six has been done away with, and the spokes of the flywheel are so bladed as to induce a draft through the radiator. One change appears in the chassis construction of the four-cylinder model, this being the location of the service brake and the employment of an electric self-starter. A single contracting band on the propeller shaft is used. The larger model had the customary internal and external expanding brakes on the rear axles.

#### Firestone-Columbus Adds Two Long-Stroke

Firestone-Columbus automobiles are made with three types of motor, one being a last year's design, while the second 1911 model has been discontinued. The 4 1-2 by 5 engine is be-

ing continued in the 60-D type and the 86-D, 4 1-8 by 5 1-4 inches and 68-D, 4 1-2 by 5 1-2 inches are added. In the 86-D motor the cylinders are cast en bloc, while in the other two types pairs are used. The L-head design is in evidence throughout. Ignition, carburetion, lubrication and transmission systems are very much alike in all three types, but they differ in regard to the brake type used, the 60-D having contracting service brakes and expanding. The crankshafts in all models are carried on ball bearings, while last year crankshaft bearings were of the plain type. The revised 60-D type has 36-inch wheels instead of 34-inch ones, with a tire of 4 inches. On model 68-D 36 by 4 1-2-inch tires are used. The 86-D type has 34 by 4-inch tires fitted to it and a wheelbase of 116 inches, while in the other two models this dimension is 121 inches, last year's edition of the 60-D having had a wheelbase of 120 inches.

#### Great Western Body Refinements

The Great Western Automobile Co. has not changed its product save for the new bodies. These are of the detachable fore-door type in which the straight-line idea has been carefully worked out by placing the handles for the doors inside the tonneau. These cars have front doors that can be easily removed and which leave a finished open touring car when the front doors are off. They are equipped with a door under the rear seat compartment. Demountable rims are fitted adapted for 35 by 4-inch tires.

The steering gear of the Great Western car is now mounted above the frame instead of below it; and a new type of control lever, which is brass-plated throughout, is provided.

#### Herreshoff Presents a New Line

The Herreshoff offering for 1912 includes an entirely new chassis equipped with coupé, touring and runabout bodies. This car has a block motor 3 3-8 by 3 3-4 inches; multiple disk clutch and Bosch high-tension ignition. Left-hand drive instead of right and a wheelbase shortened to 100 inches in the runabout and 105 in the touring car are among the features of the new-comer. In the motor, plain bearings now are used instead of ball bearings. There are more plates in the clutch than were previously employed, so that greater efficiency may be obtained therefrom. The shafts of the gearset are mounted in plain bearings instead of ball. Tire sizes have been reduced from 32 by 3 1-2 to 32 by 3, and fixed ignition is employed. The motor, clutch and transmission now constitute one unit, and the driving shaft, bevel gears, differential and rear axle a second unit. The crankcase of the motor is cast on special semi-steel in two horizontal sections, the uppermost forming the engine base, while the bottom section is an oil well easily removed for inspection or adjustment of connecting rods, crankshaft, etc. There are three brakes, one an external contracting band on the propeller shaft which is operated by the clutch pedal, and two internal expanding brakes, one on each of the rear wheel drums which are operated by another pedal. The gear-shifting lever is in the center of the car and mounted directly on the rear end of the transmission gearcase.

#### Hupmobile Adopts Long-Stroke

Perhaps the most noticeable changes in the Hupmobile line are the adoption of a long-stroke motor, the dimensions of which are 3 1/4 inches by 5 1/2 inches, and the discontinuance of the touring car on the 1911 chassis. In place of this is the Hupmobile 32. This has the long-stroke motor, 116-inch wheelbase and three selective speeds. The cylinders are cast en bloc with the inlet and exhaust manifolds integral therewith. A flywheel circulating splash oiling system is employed. The timing gears of the engine and magneto are driven by silent Coventry chains, and the magneto is mounted on the top of the flywheel housing in front of the dash. Among the 1912 refinements of the Hupmobile 20 are an adjustable ball housing for the universal joint; all spring hangers fitted with oilers; a new radiator which is claimed to be a third more efficient than the one previously employed; radius rods with square lock nuts

on the transmission ends to make them more easily adjustable; double springs on the foot-brake pedals; valve adjusters to maintain the correct timing and noiseless operation of the valve-operating mechanisms, etc. Fore-doors have been added, as well as Hyatt combination roller and thrust bearings at the differential and Timken roller bearings in the drive shaft and front wheels. A reserve gallon of gasoline is carried, and there is provision for warning the driver when the regular supply becomes low. On the same chassis as that of the old touring car a new roadster is constructed. The wheelbase is 110 inches and the transmission is the same as on the old car. The new touring car has right-hand drive, the gear shift and emergency brake levers are in the center.

#### Imperial Out with New Six-Cylinder Motor

For this year the Imperial line includes a six-cylinder motor with a unit power plant. As formerly, the cylinders are cast in pairs, but the unit power plant feature has also been added to the four-cylinder engine. There are four models, the 32, 33, 34 and 44. This latter is the six. Its wheelbase is 120 inches, while 34's is 116, and 32 and 33, 114 inches. On model 44 there is a long-stroke motor, the figures being 4 1-2 by 5 1-4; model 34 has a 4 5-16 by 5 1-4 motor and 32 and 33 4 1-8 by 5 1-4. Another new feature is center control, while demountable rims are also fitted. Instead of using separate valve caps as heretofore, there is a single large plate covering the openings over all four valves of one pair of cylinders. A peculiar form of disk clutch replaces the cone clutch of last season, it being made up of forty-one disks beveled to an angle of 20 degrees, the clutch engagement being effected on the beveled section. This beveling is done with the idea of eliminating chattering in starting and the difficulty in plate separation in stopping the car.

Model 44 has a rear axle of the floating type, last year's cars being equipped with semi-floating axles. Also there is a difference in the springing, the front spring hanger on the rear spring not being so fastened that it swings freely on its shackle. The rear axle is supported in its proper position by the two rods going out to the other side from the front end of the third member to the underneath side of the spring hanger.

The motor on 44 has the pushrods inclosed, while the valves are mechanically operated from a single camshaft. The lubrication is effected by means of a self-contained system, the oil being circulated by being carried from the flywheel into the chambers. The thermo-syphon system of cooling is used. The wheels are 36 by 4.

#### No Changes in the King

So recently has the King car been introduced that its designers have found it unnecessary to make any material changes for the 1912 season. The coupé is the latest product of the company. It is finished with nickel trimmings throughout; is equipped with a Disco acetylene self-starter; has electric side and tail lights and gas-head lights; a Standard speedometer is fitted; and one of its best features is an adjustable driver's seat which may be pulled forward.

#### Klinekar Has Few Changes

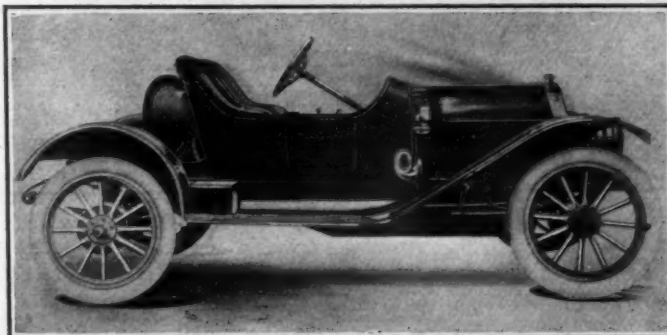
The new model Klinekars are not characterized by any radical changes in either body or chassis design. There are four separate chassis types, namely, the 6-60, the 6-50, the 4-40 and the 4-30. The same type of four-speed change-gear mechanism which characterized the 6-60 model last year has been adopted for all the other models. One feature is the manner in which the auxiliary seats disappear entirely under the front seats. Except for slight changes the motors remain the same. The wheelbase of the 6-60 has been increased from 128 inches to 130 inches, and that of the 6-50 from 124 inches to 126 inches. A slight increase in wheelbase has also been made in the two four-cylinder models.

The tire sizes have been increased so that the front-wheel sizes are applicable to the rear, and the tires are mounted on quick-detachable demountable rims with one extra rim. The

other three models have been fitted with gearsets giving four forward speeds, and the semi-floating rear axles previously used on models 4-40 and 4-50 are now replaced by floating-type axles.

#### Krit Changes to Left-Hand Drive

One of the special features of the new Krit cars is the left-hand drive, the emergency brake and the change-speed lever being located at the left of the driver. The frame of the new model is heavier, being 3 1-2 inches instead of 3-inch section. There are two elliptic springs in the rear instead of the cross spring as used on the models A and U. The elliptic springs are attached to the under side of the rear axle. Brakes are larger, being 10 inches in diameter and having a 2-inch face. They are of the internal and external type, both on the rear wheels. On several of the models the trans-



Schacht 1912 runabout with oval fuel tank

mission has been so changed that there are three speeds instead of the former two. Three models are shown for 1912. These are models A and K, and the underslung roadster, model U. The additions over last year are the five-passenger touring car (model K) and the roadster. This new roadster is constructed on the touring-car chassis. On the model A, which has been retained, the wheelbase has been increased 10 inches, from 96 inches to 106 inches.

#### Lion Introduces New Model

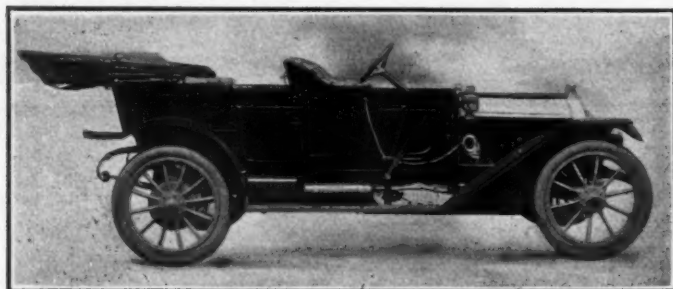
The Lion model K car, the latest addition to the company's line, shows no marked change except for the installation of a low-tension magneto, but several features have been altered to increase the easy-riding qualities. The wheelbase of model K shows an increase over that of model H, which is carried over from 1911, from 112 to 116 inches, and instead of the 36 by 3 1-2-inch tire equipment of the latter, 36 by 4-inch tires are fitted on all the wheels. Ball bearings have taken the place of roller bearings on the transmission shafts and rear axle. Owing to the changes the weight has been increased from 2,600 to 3,100 pounds. Model K is built 4 inches lower than model H. The springs, too, are longer, being 50 inches in length, whereas on H they are 42. Another refinement found on the new model is a self-starter, a Victor, while Booth demountable rims are also something new.

#### Marion Enters Long-Stroke Lists

The Marion products have entered the long-stroke class, the motors of models 48 and 35 being made 4 1-8 by 5 1-2 inches, and 4 by 4 1-2 inches respectively. The valves are 2 1-4 inches in diameter and inclosed to insure noiseless performance. The size of pushrod rollers has been increased. The crankshaft has been increased in size, being 2 1-4 inches in diameter and supported by three bearings. The rear axle has been improved in its details, being of the semi-floating type on the smaller 35 and floating on the 48. The wheelbase has been lengthened from 118 inches to 120 inches in the 48 and 26 by 4 tires have replaced the 34 by 4's. The equipment includes a Prest-O-Lite self-starter and a method of filling the gasoline tank without removing the driver's seat, by lifting a cover plate between the two front seats.

### A Pair of Sixes—McFarlan's High Throw

Two sixes, one new, constitute the McFarlan line of cars for 1912. Of the two types of power plant, one is the old 4 by 5-inch motor, while the 1911 3 5-8 by 4-inch motor has been replaced by a 4 1-4 by 5-inch design. This year the T-head cylinders are cast in two groups of three, and a cellular radiator has been fitted in place of the tubular type used for 1911. The gearbox is a unit with the rear axle this year. The 40-45 model, which uses the 4 by 5-inch motor, has a reduced wheelbase of 124 inches against 128 inches last year, while 128 inches has been retained in the construction of the new 1912 creation,



Showing a profile view of the Lexington five-passenger touring car

the model 55-60. Both these models have a self-starter of the compressed-air type.

### Metz Company Enlarges Engine

The Metz car has been changed in several respects. The water-cooled engine now has four cylinders of 3 3-4 by 4 inches, while formerly they were 3 3-10 by 3 1-2 inches. The valves are made in two pieces, with the stems sliding in guides, and pushrods being in direct touch with the cams. The wheelbase has been increased from 81 to 90 inches, and the wheel diameter from 28 to 30 inches.

### Few Changes in the Middleby

The chassis of the 1912 Middleby remains practically unchanged. Among them are the introduction of a Pittsfield magneto in the ignition system, enlargement of the clutch diameter; a pressed-steel heat-treated frame with a 6 1-2-inch drop between the front and rear axle; Timken-Detroit axles; brakes enlarged to 17 inches in diameter and 2 1-2 inches wide mark the changes.

### Paige-Detroit Entirely New Model

An entirely new engine and a new chassis design are shown in the Paige-Detroit models. Five new-style bodies, a roadster, four-passenger touring car, five-passenger touring car, semi-racer and coupé have been fitted to this new chassis, which has a 25-horsepower motor. This motor is of a new monobloc, L-head type, with dimensions of 3 3-4 inches by 4 inches. The intake manifold is cast integrally with the cylinders and there is a special carbureter of the automatic float-feed type. The wheelbase is 104 inches. The sight feeds on the dash have been discarded and sights have been placed on the motor crankcase. The clutch spindle now is fitted with roller bearings instead of a plain bronze bushing; the clutch is 1 1-2 inches larger in diameter and has one-half times as much friction surface; four springs instead of three are used to engage the clutch, which makes for smoother operations; ten steel plates with cork inserts are used instead of twenty-four alternately bronze and steel ones; and instead of carrying the disks on studs they now are carried in milled grooves. In the gearset the pitch of the gears is increased from 8-10 to 6-8, making them heavier and stronger. As now designed the rear end of the gearset can be removed with the square shaft and universal joint intact. The chassis springs are stiffer. The steering wheel is 1 inch larger in diameter; the throttle tube is inclosed in the steering column. By using drop-forged control levers instead of malleable castings the control levers have been stiffened up; and a bronze bushing has been

fitted in the gear-shifting lever which facilitates shifting it. In the cooling system the radiator is 2 inches wider and 1 inch higher and the fan is attached to the cylinders of the motor instead of the radiator.

### Paterson Adds New Model

The only notable change in the Paterson line is the addition of a 45-horsepower model with a new and larger motor, which has cylinder dimensions of 4 1-2 inches by 5 1-4 inches. The motor cylinders are cast in pairs and are of the L-head type. Other noticeable points of merit include a multiple-disk clutch, floating, instead of a semi-floating, rear axle, and 36 by 4-inch tires. The new model can be had as a seven-passenger touring car at an additional cost of \$50. The regular body for this new car is of the five-passenger type. The wheelbases of these older models have been increased to 108 inches while that of the new model is 120 inches.

### Rambler Line Shows Minor Changes

There are quite a number of refinements noticeable in the 1912 Rambler line. The three 1912 chassis are alike in general construction, but different in motor sizes, wheelbases, wheel sizes, springs, etc. On these chassis but two motor sizes are used, namely, a 4 1-2-inch square motor and a larger one with a 5-inch bore and a 5 1-2-inch stroke. One of the most important changes is a rearrangement of the motor appurtenances so that now the water pump, lubricator and magneto are on the left side. The water pump now is in the rear of the cross piece forming the front motor support and the magneto and lubricator have changed positions, the magneto being at the rear, thus offering a convenient means of supporting the wiring outfit. Another change is that the fan now is driven by a leather belt from a pulley on the end of the pump shaft, whereas heretofore it was driven by a pulley on the crankshaft. The lubricating system has been improved in that the oiler is now a seven-feed type with four oil tubes leading to the four cylinders, the others to the crankshaft. This year 3-4 elliptic springs are employed in the rear instead of the 7-8 design of 1911 and heavy gusset plates are now used at the rear corners of the frame.

### R. C. H. a New Car

The R. C. H. model F motor is rated at 22 horsepower, having a bore of 3 1-4 inches and stroke of 5 inches. The wheelbase of the chassis is 86 inches in the runabout and 110 inches in the touring car, the tread being 56 inches in both. The tires are 30 by 3 inches.

Among the salient features of the design is the fact that the motor is cooled by the thermo-syphon system. The cylinders are a monobloc casting and the crankshaft is carried upon two bearings. The valve action of the motor is entirely inclosed, but so arranged that it may be readily inspected by the simple removal of a cover plate. The gearset housing, an integral part of the rear axle, is of one-piece construction throughout. Another feature is the location of the control lever in the center. The driver sits on the left, which places the lever at his right.

### Regal Adds Large Chassis

The Regal factory has added an entirely new chassis to its line for the season 1912, having an engine with a bore of 4 1-4 inches and a stroke of 4 1-2 inches. This gives a rated horsepower of 35. The body, a five-passenger touring, is of underslung construction. Other innovations comprise two underslung touring cars known as the model T or 25 and the model H or 35, the former having an en bloc motor and the latter a motor whose cylinders are cast in pairs. Easier riding qualities have been obtained in the model 30 by making the springs free on the rear axle and increasing the wheelbase from 106 to 110 inches.

### One Model Added to Schacht Line

There has been added to the Schacht line a new model designated J-M, equipped with a standard foredoor touring car body. This new model has a 45-50-horsepower motor with a

4 1-2-inch bore and 5-inch stroke, in which the cylinders are cast en bloc and the valve mechanism all inclosed. The transmission gearset is larger and heavier than on the other Schacht models, and the frame of the chassis has 4-inch side members, which is 1-2 inch heavier than those of other models. A full-floating axle with annular ball bearings in the rear hubs is used instead of the semi-floating type. This model is built exclusively with the steering gear on the left-hand side and the control lever in the center of the car. The new model is fitted with a self-starting mechanism and a double ignition system with a Mea magneto.

The Schacht company has just designed a new eight-passenger car that is unique in that there are two seats in the tonneau which face each other and are capable of carrying three passengers each. This car has a 136-inch wheelbase and is equipped with 35 by 4 1-2-inch tires; otherwise the specifications are the same as on the model J-M.

#### Stutz, a New Proposition, Is Making Good

The Stutz car has a four-cylinder, T-head motor of 4 3-4 inches bore by 5 1-2 inches stroke. The crankshaft is hollow and is a high-grade steel dropforging provided with long white-bronze bushings. The bearings are adjustable by means of through bolts. The multiple-disk clutch runs in oil. The transmission and differential housing form a unit with the semi-floating axle, which was designed by Stutz. The tires are 34 by 4 1-2 inches all around and the wheelbase is 120 inches. Eise-mann's high-tension dual system and Schebler carbureter are included among the standard equipment of the motor. The cellular radiator is of large area and is mounted on artillery trunnions. The design of the car is underslung, with a road clearance of 10 inches. A Gemmer steering gear is used.

#### Stuyvesant Improves on the Gaeth

The initial appearance of the Stuyvesant car calls to mind the fact that it is practically the old Gaeth car of 1911 rebuilt, improved and refined. The new car differs from the Gaeth, however, in that it has left-hand drive with center control lever; the transmission gearset gives four forward speeds and reverse instead of three; the propellor shaft is inclosed in the torsion tube and has but one universal joint at the forward end; a floating instead of semi-floating rear axle is employed; three-quarter rear spring are used in place of semi-elliptics; and the tires are 36 by 4 1-2 inches front and rear instead of 4-inch front and 4 1-2-inch in the rear. The chassis and equipment on all four models is practically the same. An electric generator driven from the motor furnishes power for two large 12-inch headlamps on the front, two side lamps and a tail light. The car carries 150 ampere hour 12-volt storage battery and also an electric motor for starting the engine at the fly-wheel. Booth demountable rims for 36 by 5-inch tires all around are standard on the seven-passenger body and 36 by 4 1-2-inch tires on the five-passenger and four-passenger models are provided.

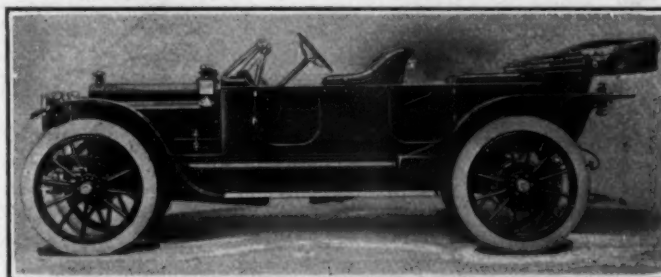
#### Vellie Has New Six-Passenger Touring Car

The Vellie Company has added a six-passenger touring car for 1912. This new model has a wheelbase of 121 inches and is equipped with 36-inch by 4 1-2-inch tires. The brakes are 17 inches in diameter. This is the third year of the Vellie motor, which has a bore of 4 1-2 inches and a 5 1-4-inch stroke, with L-type cylinders cast in pairs. A number of refinements are to be noticed. The height of the radiator has been increased 2 inches, the valves are inclosed and the magneto has been changed from the rear right side of the motor to the left front, making it more accessible. This is true of all models except the Racy-type. The valves are inclosed by removable cover plates, while all motor piping connections have been made to conform with the S. A. E. standards. All piping is held to the engine by expanding lock connections instead of being bolted and fitted with gaskets as heretofore. The three-disc dry plate clutch bearing surface has been increased, and it is fitted with a new type re-

taining ring for quicker removal. The base of the motor has been changed somewhat and is so arranged that the removal of the oil reservoir permits the pistons and connecting rods to be taken out through the bottom without dismantling the cylinders. One of the features of Vellie construction for this year is the design of the magneto coupling. In place of the Oldham coupling for the magneto shaft and Atwater-Kent distributor, two face plates are used, one of which has ten holes in its circumference and the other twelve holes, so that sixty variations in magneto timing may be obtained by simply changing the connection at the coupling. A three-way switch permits either the Atwater-Kent system or the magneto system to be used, or both together. On all except the new six-passenger car the brakes have been increased from a diameter of 12 inches to 14 inches, and they have been widened from 2 inches to 2 1-2 inches. The brake rods have been separated and are placed inside the frame. In addition to the new six-passenger model, five other models from last year have been carried over. On the new model the frame has a double drop. The wheelbase has been increased on the other models from 115 inches to 118 inches, making a roomier tonneau.

#### Warren-Detroit Out with New Body Model

The Warren-Detroit line for the season of 1912 will include two new chassis models. These are known as model 35, which may be fitted with a touring or roadster body, and the model 40 touring. The model 30 of 1911 remains unchanged except that it is designated 12-30 and is equipped with an acetylene self-starting mechanism. The motor of the new model 35 has a 1-8-inch larger bore than the old 30, inclosed valves, a new design of mushroom revolving push rods, a single unit vibrating coil, combined high-tension timer and distributor and a DU4 Bosch magneto in the double ignition system. The wheelbase is 112 inches, which is 2 inches longer than that of the 30; chassis springs are increased from 45 to 50 inches in length to improve the riding qualities; and the body designs are of a refined straight-line type. The new model 40 is heavier and larger throughout than the old models and differs in that the valves of the motor are on the left instead of the right side, while the pump and carbureter are on the right. The gearset has both shafts in the same vertical plane instead of being arranged horizontally opposite each other, and they are mounted on annular ball bearings mounted in cages. Instead of having the propellor shaft inclosed in a torsion tube, that of the 40 is exposed, has two thoroughly incased universal joints and the torsional strains are absorbed by a torsion member. The rear axle is a floating design



The Owen touring car is an example of the modern straight-line body design

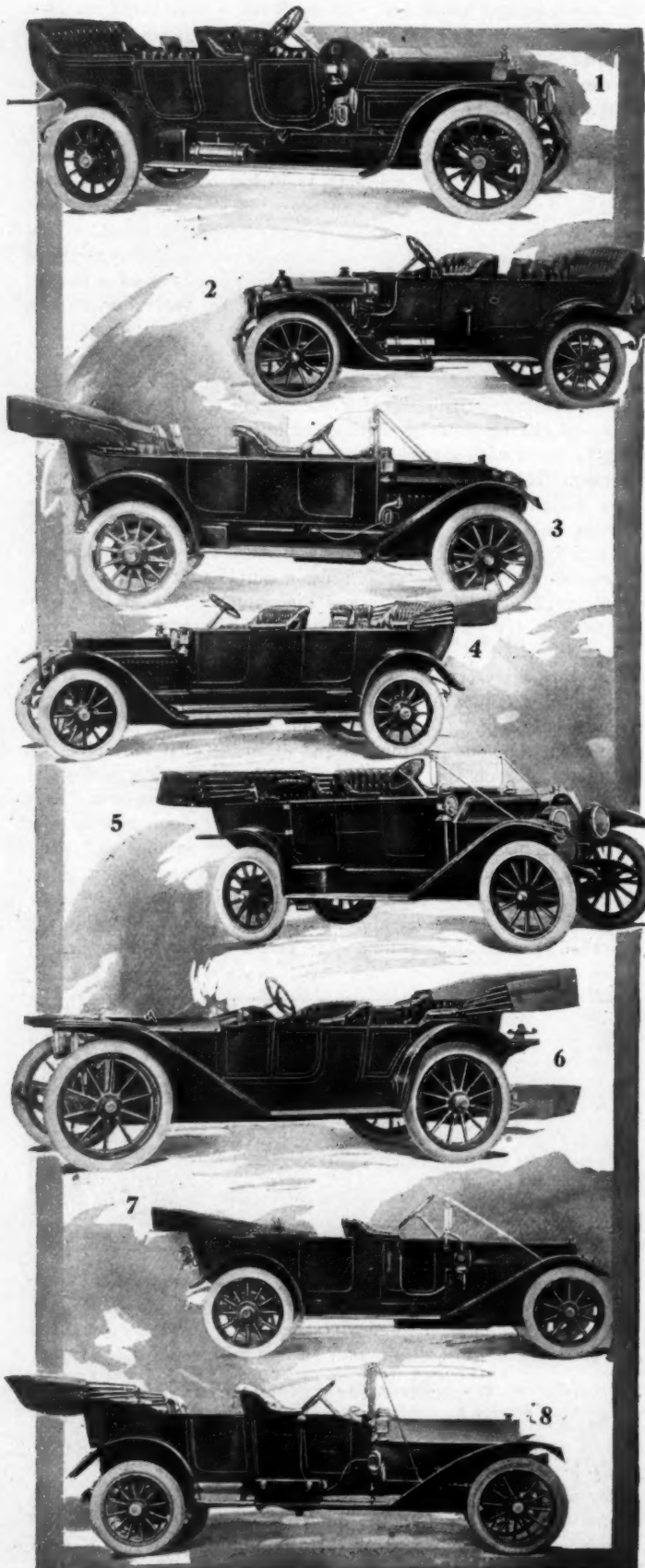
having a continuous pressed steel housing; and its differential and driving gears are all mounted in unit on a removable carrier.

#### Westcott Adds a New Motor

The Westcott line was represented last year by but a single chassis which was equipped with a motor having a stroke of 4 3-4 inches and a bore of 5 inches. This year, however, a motor of 4 1-2-inch bore and 5-inch stroke has been added. The former motor is fitted to the model R while the new motor is found on models K, L and M. An aluminum crankcase is used in the new motor, which carries five main bearings. The Disco self-starter is fitted to all models.

# Price Classification of Automobiles

## \$4000 Class—Cars That



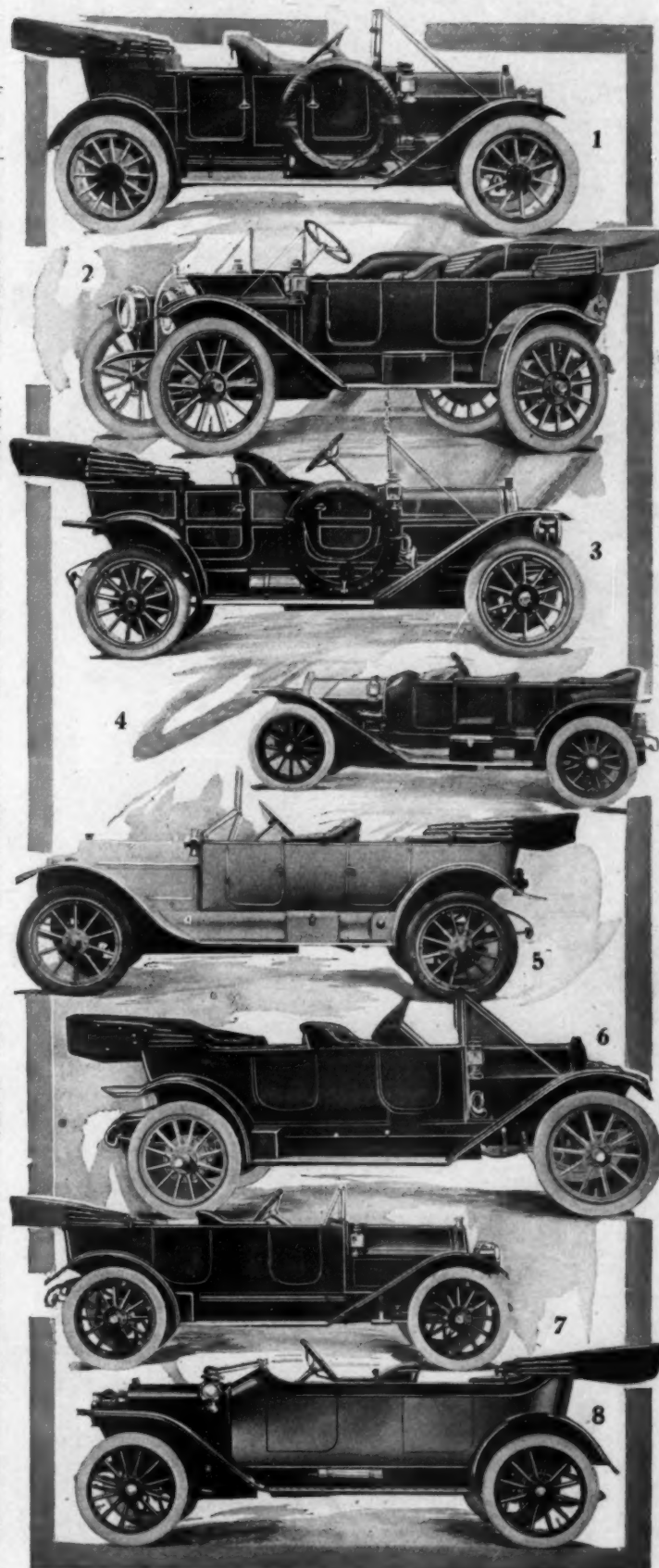
Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Adams-Farwell 9.	Roadster...	\$3000	2	60.5	128	36x4 1/2	36x4 1/2
Abbott-Detroit...	Limousine...	3000	7	32.4	120	36x4	36x4
Alco 40	Touring...	4500	7	44.1	126	36x4	36x5
Alco 40	T. Tonneau...	4500	5	44.1	126	36x4	36x5
Alco 40	Runabout...	4500	2	44.1	126	36x4	36x5
Alco 40	Limousine...	4500	7	44.1	126	36x4	36x5
Alco 40	Landaulet...	5500	7	44.1	126	36x4	36x5
Alco 40	Limousine...	6000	7	44.1	126	36x4	36x5
Alco 60	Touring...	6000	7	54.1	134	36x4	36x5
Alco 60	T. Tonneau...	6000	5	54.1	134	36x4	36x5
Alco 60	Runabout...	6000	2	54.1	134	36x4	36x5
Alco 60	Limousine...	6750	7	54.1	134	36x4	36x5
Alco 60	Landaulet...	6750	7	54.1	134	36x4	36x5
Alco 60	Limousine...	7250	7	54.1	134	36x4	36x5
American Trav...	F'd'r Tour...	4250	4	46.0	124	40x4	41x4 1/2
American Trav...	F'd'r Tour...	4500	6	46.0	140	41x4 1/2	41x4 1/2
Amplex H-K	Roadster...	4500	2	.....	128	36x4 1/2	37x5
Amplex H-K	T. Tonneau...	4500	5	.....	128	36x4 1/2	37x5
Amplex H-K	Touring...	4500	7	.....	128	36x4 1/2	37x5
Amplex H-K	Limousine...	5650	7	.....	128	36x4 1/2	37x5
Apperson 4-65	Touring...	4200	7	48.4	129	36x4 1/2	37x5
Atlas Knight	Torpedo...	3500	4	32.4	130	36x4 1/2	36x4 1/2
Atlas Knight	Touring...	3500	5	32.4	130	36x4 1/2	36x4 1/2
Atlas Knight	Phaeton...	3500	6	32.4	130	36x4 1/2	36x4 1/2
Atlas Knight	Touring...	3700	7	32.4	140	37x5	37x5
Auburn 6-50	F'd'r Tour...	3000	7	40.9	135	37x4 1/2	37x4 1/2
Austin 45	Touring...	3600	5	45.9	126	36x4 1/2	36x4 1/2
Austin 45	Runabout...	3600	2	45.9	126	36x4 1/2	36x4 1/2
Austin 45	Town Car...	4500	5	45.9	126	36x4 1/2	36x4 1/2
Austin 45	Limousine...	4500	7	45.9	126	36x4 1/2	36x4 1/2
Austin 50	Touring...	4400	5	48.6	135	36x4 1/2	36x4 1/2
Austin 50	Runabout...	4400	2	48.6	135	36x4 1/2	36x4 1/2
Austin 50	Limousine...	5500	7	48.6	135	36x4 1/2	36x4 1/2
Austin 50	Town Car...	5500	5	48.6	135	36x4 1/2	36x4 1/2
Austin 77	Touring...	6000	5	48.6	141	37x5	37x5
Austin 77	Limousine...	7000	7	48.6	141	37x5	37x5
Austin 77	Runabout...	6000	2	48.6	141	37x5	37x5
Babcock F	Touring...	3000	7	32.4	120	36x4 1/2	36x4 1/2
Babcock K	Touring...	3250	7	36.1	120	36x4 1/2	36x4 1/2
Bergdoll D	Limousine...	3000	7	25.6	115	36x4	36x4
Bergdoll D	Landaulet...	3100	7	25.6	115	36x4	36x4
Berkshire E	Limousine...	3700	7	39.0	124	36x4	36x4 1/2
Berkshire F	Runabout...	3750	2	58.5	134	37x5	37x5
Berkshire F	Torpedo...	4000	5	58.5	134	37x5	37x5
Berkshire F	Touring...	4000	7	58.5	134	37x5	37x5
Berkshire F	Convertible...	4500	7	58.5	134	37x5	37x5
Berkshire F	Limousine...	5260	7	58.5	134	37x5	37x5
Cadillac 1912	Limousine...	3250	7	32.4	116	36x4 1/2	36x4 1/2
Carhartt B	Limousine...	3100	7	38.0	118	34x4	34x4 1/2
Case 40	Limousine...	3050	7	32.4	120	36x4	36x4
Chadwick 19	Roadster...	5500	2	60.0	112	36x4 1/2	36x4 1/2
Chadwick 19	Touring...	5500	7	60.0	133	36x4 1/2	36x4 1/2
Chadwick 19	Tourabout...	5500	5	60.0	133	36x4 1/2	36x4 1/2
Chadwick 19	Limousine...	6500	7	60.0	133	36x4 1/2	36x4 1/2
Chadwick 19	Torpedo...	5500	5	60.0	133	36x4 1/2	36x4 1/2
Chalmers 36	Limousine...	3000	7	28.9	115	36x4	36x4
Chalmers 36	Limousine...	3250	7	28.9	115	36x4	36x4
Chalmers 12	Touring...	3250	7	43.8	130	36x4 1/2	36x4 1/2
Chalmers 12	F'd'r T. Ton.	3250	4	43.8	130	36x4 1/2	36x4 1/2
Colby H	Limousine...	3500	5	27.2	121	36x4	36x4
Cole 1912	Limousine...	3000	5	32.4	122	36x4	36x4
Cole 1912	Limousine...	3250	5	32.4	122	36x4	36x4
Columbia Cavalier	Runabout...	3300	2	38.0	120	36x4	36x4
Columbia Cavalier	Touring...	3300	4	38.0	120	36x4	36x4
Columbia Cavalier	Touring...	3400	6	38.0	120	36x4	36x4
Columbia Cavalier	Touring...	3500	7	38.0	120	36x4	36x4
Columbia Cavalier	Limousine...	4800	7	38.0	120	36x4	36x4
Columbia Cavalier	Landaulet...	4900	7	38.0	120	36x4	36x4
Columbia Knight	Runabout...	4500	2	38.0	129	36x4 1/2	36x4 1/2
Columbia Knight	Touring...	4500	4	38.0	129	36x4 1/2	36x4 1/2
Columbia Knight	Touring...	4500	6	38.0	129	36x4 1/2	36x4 1/2
Columbia Knight	Touring...	4500	7	38.0	129	36x4 1/2	36x4 1/2
Columbia Knight	Limousine...	5800	7	38.0	129	36x4 1/2	36x4 1/2
Columbia Knight	Landaulet...	5800	7	38.0	129	36x4 1/2	36x4 1/2

1, Thomas 6-40; 2, White, 40; 3, Marquette, 28; 4, Locomobile; 5, Haynes 30; 6, American Traveler; 7, Chalmers Six; 8, Stevens-Duryea Y

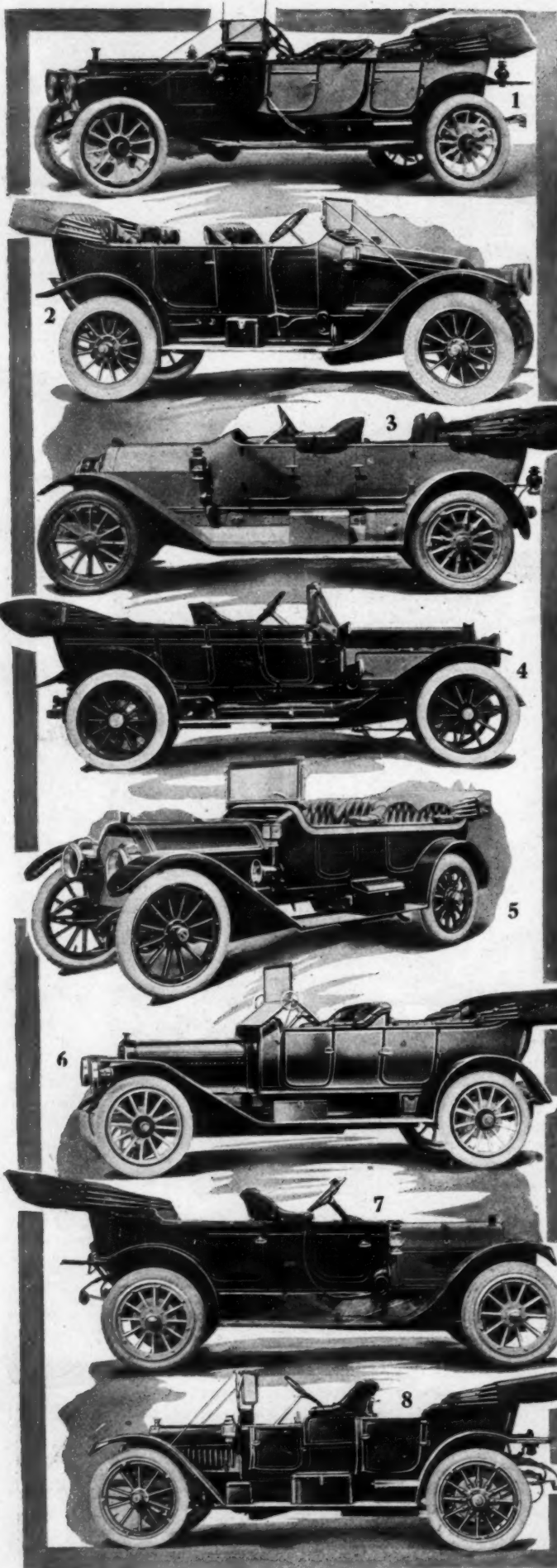
# on the American Market for 1912

## Cost \$3000 and Over

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Corbin 40.....	Touring.....	\$3000	5	36.1	120	36x4	36x4
Corbin 40.....	Touring.....	3050	7	36.1	120	36x4	36x4
Corbin 40.....	T. Tonneau..	3000	4	36.1	120	36x4	36x4
Corbin 40.....	Torpedo.....	3100	4	36.1	120	36x4	36x4
Corbin 40.....	Limousine....	4000	7	36.1	120	37x4	37x4
Cunningham J.....	Limousine....	4500	7	36.1	124	—x4	—x4
Cunningham J.....	Runabout....	3250	3	36.1	124	—x4	—x4
Cunningham J.....	Torpedo.....	3500	4	36.1	124	—x4	—x4
Cunningham J.....	Touring.....	3500	7	36.1	124	—x4	—x4
Cunningham J.....	Phaeton.....	3500	5	36.1	124	—x4	—x4
Cunningham J.....	Landaulet....	4500	7	36.1	124	—x4	—x4
Dorris G.....	Limousine....	3600	7	30.6	115	36x4	36x4
Fiat 4.....	Phaeton.....	4500	5	31.3	123	35x4	36x4
Fiat 4.....	Touring.....	4500	5	31.3	123	35x4	36x4
Fiat 4.....	Limousine....	4500	7	31.3	123	35x4	36x4
Fiat 4.....	Landaulet....	4500	7	31.3	123	35x4	36x4
Fiat 6.....	Runabout....	5500	2	47.0	135	36x4	37x5
Fiat 6.....	Phaeton.....	5500	5	47.0	135	36x4	37x5
Fiat 6.....	Touring.....	5500	7	47.0	135	36x4	37x5
Fiat 6.....	Limousine....	5500	7	47.0	135	36x4	37x5
Fiat 6.....	Landaulet....	5500	7	47.0	135	36x4	37x5
Four-Wheel Drive A.....	F'd'r Tour..	4500	7	36.1	134	36x4	36x4
Four-Wheel Drive A.....	Runabout....	4500	2	36.1	134	36x4	36x4
Four-Wheel Drive A.....	Limousine....	4500	5	36.1	134	36x4	36x4
Four-Wheel Drive A.....	Roadster....	4500	2	36.1	134	36x4	36x4
Franklin 25.....	Limousine....	3000	7	25.6	108	34x4	34x4
Franklin 25.....	Landaulet....	3000	7	25.6	108	34x4	34x4
Franklin D.....	Touring.....	3500	5	38.4	123	36x4	37x5
Franklin D.....	Tor. Phaet'n	3500	4	38.4	123	36x4	37x5
Franklin H.....	Touring.....	4000	7	38.4	126	36x4	37x5
Franklin H.....	Limousine....	5000	7	38.4	126	36x4	37x5
Frontenac E.....	Touring.....	3500	7	36.1	123	34x4	34x4
Garford G-12.....	Touring.....	3500	5	28.9	119	34x4	34x4
Garford G-8.....	Limousine....	3500	7	36.1	119	36x4	36x4
Garford G-14.....	Touring.....	3500	7	43.8	138	36x4	37x5
Great Eagle 4-50.....	F'd'r Tour..	3850	5	36.1	135	36x4	36x4
Great Eagle 4-50.....	Limousine....	4000	7	36.1	135	36x4	36x4
Great Eagle 4-50.....	Landaulet....	4000	7	36.1	135	36x4	36x4
Great Eagle 4-50.....	F'd'r Lim..	4500	7	36.1	135	36x4	36x4
Great Eagle 6-60.....	F'd'r Tour..	4250	7	40.9	138	36x4	37x5
Haynes Y.....	Touring.....	3000	7	40.0	127	36x4	37x5
Haynes Y.....	Close Couple	3000	4	40.0	127	36x4	37x5
Haynes Y.....	Limousine....	3800	7	40.0	127	36x4	37x5
Haynes Y.....	Limousine....	3900	7	40.0	127	36x4	37x5
Inter-State 50.....	F'd'r Tour..	3400	7	40.0	124	36x4	36x4
Inter-State 51.....	Demi-tonn..	3400	4	40.0	124	36x4	36x4
Inter-State 52.....	Roadster....	3400	2	40.0	124	36x4	36x4
Johnson B.....	Limousine....	3500	5	32.4	112	36x4	36x4
Johnson C.....	F'd'r Tour..	3100	7	40.0	124	36x4	36x4
Johnson C.....	Touring.....	3000	7	40.0	124	36x4	36x4
Johnson C.....	Limousine....	4000	7	40.0	124	36x4	36x4
Johnson C.....	F'd'r Lim..	4500	7	40.0	124	36x4	36x4
Jonz D.....	Brougham..	3100	5	32.4	120	36x4	36x4
Kisselkar 60.....	F'd'r Tour..	3000	7	48.6	132	37x5	37x5
Kisselkar 60.....	Semi-tour..	3000	5	48.6	132	37x5	37x5
Kisselkar 60.....	Semi-racer..	3000	2	48.6	132	37x5	37x5
Klinekar 6-60.....	Touring.....	3200	7	43.8	130	38x4	38x4
Klinekar 6-60.....	Touring.....	3200	6	43.8	130	38x4	38x4
Klinekar 6-60.....	T. Tonneau..	3200	4	43.8	130	38x4	38x4
Klinekar 6-60.....	Meteor.....	3200	2	43.8	130	38x4	38x4
Knox R.....	Torpedo.....	3450	4	40.0	117	36x4	36x4
Knox R.....	Raceabout..	3300	4	40.0	117	36x4	36x4
Knox R.....	Raceabout..	3200	2	40.0	117	36x4	36x4
Knox R.....	T. Tonneau..	3500	5	40.0	122	36x4	36x4
Knox R.....	Limousine....	4250	7	40.0	122	36x4	36x4
Knox R-45.....	T. Tonneau..	3800	7	40.0	126	37x5	37x5
Knox R-45.....	Limousine....	4700	7	40.0	126	37x5	37x5
Knox R-45.....	Torpedo.....	3700	6	40.0	126	37x5	37x5
Knox R-45.....	Raceabout..	3600	2	40.0	126	37x5	37x5
Knox S.....	Raceabout..	4800	4	60.0	134	38x5	38x5
Knox S.....	Ton'ette....	4900	5	60.0	134	38x5	38x5
Knox S.....	T. Tonneau..	5000	7	60.0	134	38x5	38x5
Knox S.....	Torpedo.....	5000	6	60.0	134	38x5	38x5
Knox S.....	Limousine....	6400	7	60.0	134	38x5	38x5
Locomobile L-4.....	Touring.....	3500	5	32.4	120	34x4	34x4



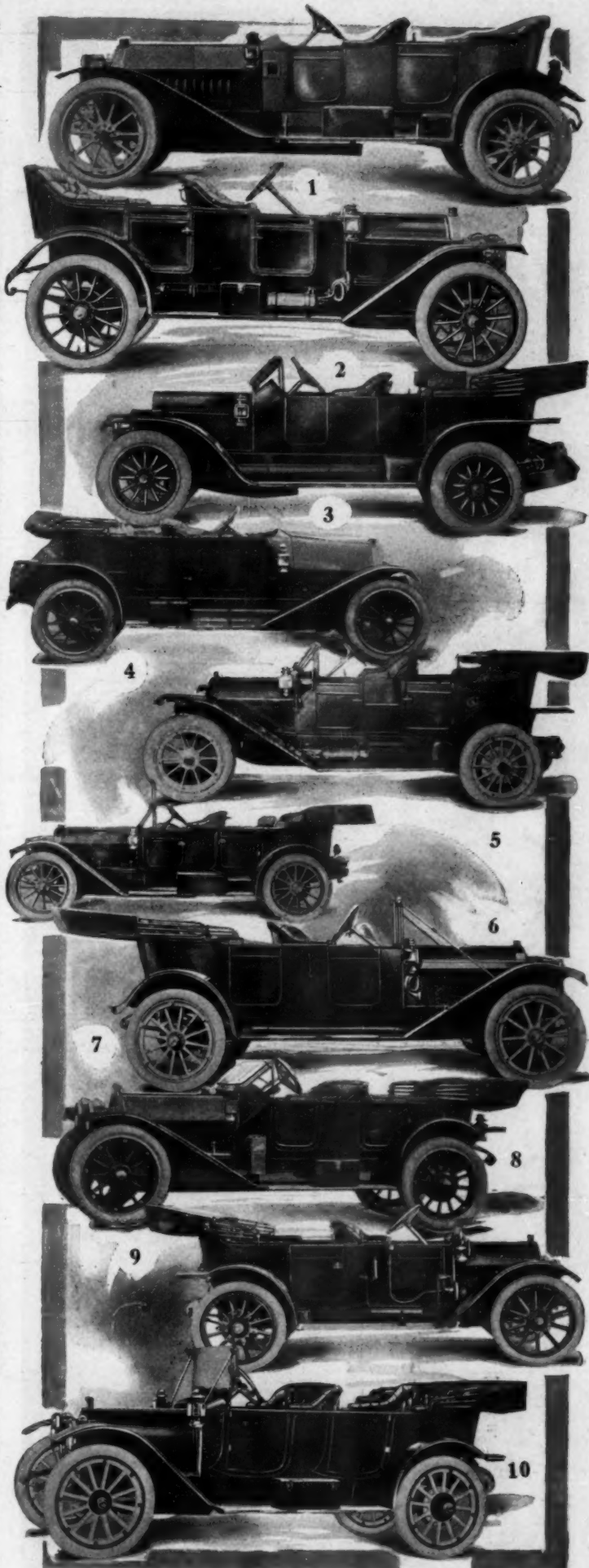
1, Marmon 32; 2, Ohio Regular; 3, Velie G; 4, Mercer; 5, Case 40; 6, Cartecar 5; 7, Imperial 50; 8, R. C. H.



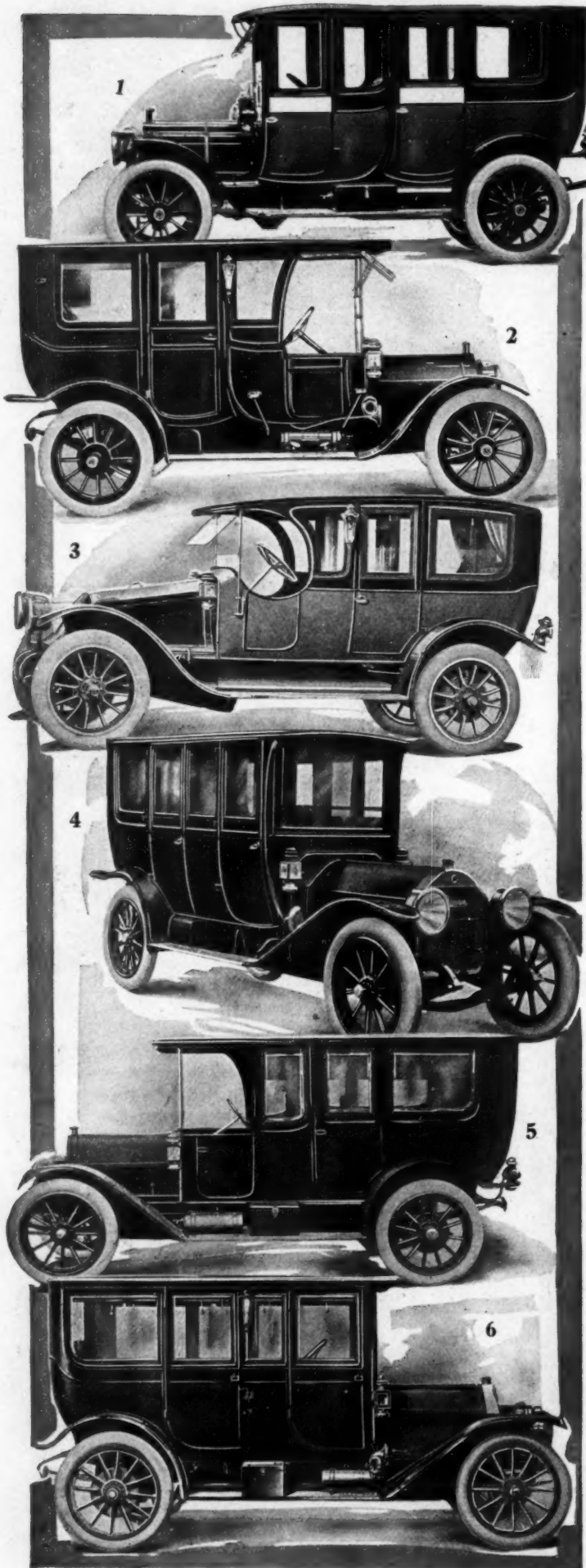
Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Locomobile L-4...	T. Tonneau...	\$3500	4	32.4	120	34x4	34x4
Locomobile L-4...	Torpedo...	3700	4	32.4	120	34x4	34x4
Locomobile L-4...	Limousine...	4600	7	32.4	120	34x4	34x4
Locomobile L-4...	Landaulet...	4700	6	32.4	120	34x4	34x4
Locomobile M-2...	Touring...	4800	7	48.6	135	36x4	37x5
Locomobile M-2...	Landaulet...	6150	6	48.6	135	36x4	37x5
Locomobile M-2...	Torpedo...	4800	4	48.6	135	36x4	37x5
Locomobile M-2...	Torpedo...	4800	5	48.6	135	36x4	37x5
Locomobile M-2...	Torpedo...	4800	4	43.8	128	36x4	36x4
Locomobile, L'tie 6	Touring...	4200	5	43.8	128	36x4	36x4
Locomobile, L'tie 6	Touring...	5550	7	43.8	128	36x4	36x4
Locomobile, L'tie 6	Landaulet...	5650	7	43.8	128	36x4	36x4
Lozier 46	Lakewood...	4700	5	46.0	124	36x4	36x5
Lozier 46	Briercliff...	4700	5	46.0	124	36x4	36x5
Lozier 46	Riverside...	4700	7	46.0	124	36x4	36x5
Lozier 46	Limousine...	6200	7	46.0	124	36x4	36x5
Lozier 46	Landaulet...	6200	5	46.0	124	36x4	36x5
Lozier 51	Lakewood...	5000	5	34.2	131	36x4	36x5
Lozier 51	Briercliff...	5000	5	34.2	131	36x4	36x5
Lozier 51	Riverside...	5000	7	34.2	131	36x4	36x5
Lozier 51	Limousine...	6500	7	34.2	131	36x4	36x5
Lozier 51	Landaulet...	6500	5	34.2	131	36x4	36x5
Luverne 750	Touring...	3000	5	36.1	128	36x4	36x4
Marathon N-50	Limousine...	3250	7	32.4	121	37x4	37x4
Marmion 32	Limousine...	4000	7	32.4	120	35x4	35x4
Marmion 32	Landaulet...	4100	7	32.4	120	35x4	35x4
Marquette 22	Roadster...	3000	2	40.0	122	36x4	36x4
Marquette 24	Tourabout...	3000	4	40.0	122	36x4	36x4
Marquette 25	Touring...	3000	5	40.0	122	36x4	36x4
Marquette 27	Touring...	3000	7	40.0	122	36x4	36x4
Marquette 27	Limousine...	3500	7	40.0	122	36x4	36x4
Marquette 28	Touring...	4000	7	40.0	119	36x4	36x4
Marquette 28	Limousine...	4500	7	40.0	119	36x4	36x4
Matheson 50	Touring...	3500	5	48.6	125	36x4	36x4
Matheson 50	Fore-door...	3750	5	48.6	125	36x4	36x4
Matheson 50	F'd'r Tour...	4000	7	48.6	125	36x4	36x4
Matheson 50	T. Tonneau...	3500	4	48.6	125	36x4	36x4
Matheson 50	Speedster...	3500	2	48.6	125	36x4	36x4
Matheson 50	Touring...	4000	7	48.6	135	36x4	36x4
Matheson 50	Limousine...	6700	7	48.6	135	36x4	36x4
Matheson 50	Limousine...	6000	6	48.6	135	36x4	36x4
Matheson 50	Demi-lim...	6500	7	48.6	135	36x4	36x4
Matheson 50	Town Car...	4700	6	48.6	135	36x4	36x4
Mercer 35 A-B	Limousine...	3750	7	32.4	118	34x4	34x4
Midland R	Coupe...	3000	3	32.4	118	35x4	35x4
Midland O	Roadster...	3000	2	45.5	118	35x4	35x4
Mitchell 5-6 & 2-6	Limousine...	3000	5	33.7	125	36x4	36x4
Moon 40	Limousine...	3000	7	32.4	120	36x4	36x4
Moon 40	Limousine...	3200	5	32.4	120	36x4	36x4
Moon 45	Touring...	3000	7	36.1	123	36x4	36x4
Moon 45	Torpedo...	3100	4	36.1	123	36x4	36x4
Moon 45	Raceabout...	3000	2	36.1	123	36x4	36x4
Moon 45	Limousine...	4800	7	36.1	123	36x4	36x4
Morse D	Touring...	4200	7	34.2	127	36x4	37x5
Morse D	Touring...	4200	5	34.2	127	36x4	37x5
Morse D	Torpedo...	4200	4	34.2	127	36x4	37x5
National Touring	Touring...	3000	7	40.0	124	36x4	36x4
National Series V	F'd'r Tour...	3000	7	38.0	128	36x5	36x5
Oakland 45	Limousine...	3000	7	32.4	120	36x4	36x4
Octoauto	Fore-door 8 wheels...	3200	4	30.6	175	34x3	34x4
Octoauto	Fore-door 8 wheels...	3200	5	30.6	175	34x3	34x4
Ohio, Regular	Limousine...	3350	7	32.4	115	36x4	36x4
Oldsmobile Def...	Touring...	3000	5	25.6	116	36x4	36x4
Oldsmobile Def...	Tourabout...	3000	4	25.6	116	36x4	36x4
Oldsmobile Def...	Roadster...	3000	2	25.6	116	36x4	36x4
Oldsmobile Def...	Coupe...	3600	3	25.6	116	34x4	34x4
Oldsmobile Autoc...	Touring...	3500	7	40.0	126	39x5	39x5
Oldsmobile Autoc...	Limousine...	4700	7	40.0	126	39x5	39x5
Oldsmobile Autoc...	Tourabout...	3500	4	40.0	126	38x4	38x4
Oldsmobile Autoc...	Roadster...	3500	2	40.0	126	38x4	38x4
Oldsmobile Lim...	Tourabout...	5000	4	60.0	140	42x4	42x4
Oldsmobile Lim...	Roadster...	5000	2	60.0	140	42x4	42x4
Oldsmobile Lim...	Touring...	5000	7	60.0	140	43x5	43x5
Oldsmobile Lim...	Limousine...	6300	7	60.0	140	43x5	43x5
Otto	Limousine...	3250	5	28.9	123	34x3	34x3
Otto	Landaulet...	3250	5	28.9	123	34x3	34x3
Otto	F'd'r Lim...	3250	4	28.9	123	34x3	34x3
Packard 18 Run...	Runabout...	3200	2	36.4	108	34x4	34x4
Packard 18 Stand...	Touring...	3200	5	36.4	112	34x4	34x4
Packard 18 Stand...	Runabout...	3200	2	36.4	112	34x4	34x4
Packard 18 Stand...	Coupe...	3900	2	36.4	112	34x4	34x4
Packard 18 Stand...	Limousine...	4400	5	36.4	112	34x4	34x4
Packard 18 Stand...	Landaulet...	4500	5	36.4	112	34x4	34x4
Packard 18 Stand...	Imp. Lim...	4600	5	36.4	112	34x4	34x4
Packard 18 Stand...	Imp. Land...	4700	5	36.4	112	34x4	34x4
Packard 30 Run...	Runabout...	4200	2	40.0	114	36x4	37x5
Packard 30 Stand...	Touring...	4200	7	40.0	123	36x4	37x5
Packard 30 Stand...	Cl. Coupled...	4200	5	40.0	123	36x4	37x5
Packard 30 Stand...	Coupe...	4900	2	40.0	123	36x4	37x5
Packard 30 Stand...	Limousine...	5450	7	40.0	123	36x4	37x5
Packard 30 Stand...	Brougham...	5500	5	40.0	123	36x4	37x5

1, Packard Six; 2, Franklin H; 3, Simplex; 4, Peerless 30 Six; 5, Alco 6-60; 6, Winton Six; 7, Pope-Hartford 27; 8, Stearns-Knight

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Packard 30 Stand.	Landulet...	\$5550	7	40.0	123	36x4	37x5
Packard 30 Stand.	Imp. Lim.	5650	7	40.0	123	36x4	37x5
Packard 30 Stand.	Imp. Land.	5750	7	40.0	123	36x4	37x5
Packard 30 Phae.	Phaeton...	4200	5	40.0	123	36x4	37x5
Packard 6 Run.	Runabout...	5000	2	48.6	123	36x4	37x5
Packard 6 Stand.	Touring...	5000	7	48.6	133	36x4	37x5
Packard 6 Stand.	Cl. Coupled.	5000	5	48.6	133	36x4	37x5
Packard 6 Stand.	C. upe...	5700	2	48.6	133	36x4	37x5
Packard 6 Stand.	Limousine.	6250	7	48.6	133	36x4	37x5
Packard 6 Stand.	Brougham.	6300	5	48.6	133	36x4	37x5
Packard 6 Stand.	Landulet...	6350	7	48.6	133	36x4	37x5
Packard 6 Stand.	Imp. Lim.	6450	7	48.6	133	36x4	37x5
Packard 6 Stand.	Imp. Land.	6500	7	48.6	133	36x4	37x5
Packard 6 Phae.	Phaeton...	5000	5	48.6	139	36x4	37x5
Palmer-Singer 46.	Limousine.	4150	7	38.4	126	36x4	36x4
Palmer-Singer 46.	Landulet...	4250	7	38.4	126	36x4	36x4
Palmer-Singer 6-60.	Touring...	3000	5	57.0	138	36x4	36x5
Palmer-Singer 6-60.	Touring...	3600	7	57.0	138	36x4	36x5
Palmer-Singer 6-60.	Runabout...	3000	2	57.0	138	36x4	36x5
Palmer-Singer 6-60.	Limousine.	4500	7	57.0	138	36x4	36x5
Palmer-Singer 6-60.	Landulet...	4600	7	57.0	138	36x4	36x5
Peerless D.	Limousine.	4200	4	25.6	113	34x4	34x4
Peerless D.	Landulet...	4300	4	25.6	113	34x4	34x4
Peerless J.	Touring...	4000	3	38.4	125	36x4	36x4
Peerless J.	Torpedo...	4000	2	38.4	125	36x4	36x4
Peerless J.	Roadster...	4000	2	38.4	125	36x4	36x4
Peerless J.	Limousine.	5000	4	38.4	125	36x4	36x4
Peerless J.	Landulet...	5100	4	38.4	125	36x4	36x4
Peerless J.	Berline...	5200	4	38.4	125	36x4	36x4
Peerless H.	Touring...	4300	4	40.0	124	36x4	37x5
Peerless H.	Torpedo...	4800	4	40.0	124	36x4	37x5
Peerless H.	Phaeton...	4300	4	40.0	124	36x4	37x5
Peerless H.	Limousine.	5300	4	40.0	124	36x4	37x5
Peerless H.	Berline...	5500	4	40.0	124	36x4	37x5
Peerless H.	Landulet...	5400	4	40.0	124	36x4	37x5
Peerless K.	Touring...	5000	4	48.6	137	36x4	37x5
Peerless K.	Phaeton...	5000	3	48.6	137	36x4	37x5
Peerless K.	Torpedo...	5000	4	48.6	137	36x4	37x5
Peerless K.	Landulet...	6100	4	48.6	137	36x4	37x5
Peerless K.	Limousine.	6000	4	84.6	137	36x4	37x5
Peerless K.	Berline...	6200	4	84.6	137	36x4	37x5
Peerless L.	Touring...	6000	4	60.0	140	37x5	38x5
Peerless L.	Torpedo...	6000	4	60.0	140	37x5	38x5
Peerless L.	Phaeton...	6000	3	60.0	140	37x5	38x5
Peerless L.	Limousine.	7000	4	60.0	140	37x5	38x5
Peerless L.	Landulet...	7100	4	60.0	140	37x5	38x5
Peerless L.	Berline...	7200	4	60.0	140	37x5	38x5
Pierce-Arrow 36-R	Runabout...	4000	3	38.4	119	36x4	36x4
Pierce-Arrow 36-T	Touring...	4000	4	38.4	127	36x4	36x4
Pierce-Arrow 36-T	Touring...	4000	5	38.4	127	36x4	36x4
Pierce-Arrow 36-T	Brougham...	4900	5	38.4	127	36x4	36x4
Pierce-Arrow 36-T	Landulet...	4900	5	38.4	127	36x4	36x4
Pierce-Arrow 48-R	Runabout...	4850	3	48.6	128	36x4	36x4
Pierce-Arrow 48-T	Touring...	4850	4	48.6	134	37x5	37x5
Pierce-Arrow 48-T	Touring...	4850	5	48.6	134	37x5	37x5
Pierce-Arrow 48-T	Touring...	5000	7	48.6	134	37x5	37x5
Pierce-Arrow 48-T	Brougham...	5750	5	48.6	134	37x5	37x5
Pierce-Arrow 48-T	Landulet...	5750	5	48.6	134	37x5	37x5
Pierce-Arrow 48-T	Suburban...	6100	7	48.6	134	37x5	37x5
Pierce-Arrow 48-T	Vest. Sub.	6450	7	48.6	134	37x5	37x5
Pierce-Arrow 66-R	Runabout...	5850	2	60.0	133	37x5	37x5
Pierce-Arrow 66-T	Touring...	5850	4	60.0	140	37x5	38x5
Pierce-Arrow 66-T	Touring...	5850	5	60.0	140	37x5	38x5
Pierce-Arrow 66-T	Touring...	6000	7	60.0	140	37x5	38x5
Pierce-Arrow 66-T	Brougham...	6750	5	60.0	140	37x5	38x5
Pierce-Arrow 66-T	Landulet...	6750	5	60.0	140	37x5	38x5
Pierce-Arrow 66-T	Landulet...	7100	7	60.0	140	37x5	38x5
Pierce-Arrow 66-T	Suburban...	7100	7	60.0	140	37x5	38x5
Pierce-Arrow 66-T	Vest. Sub.	7450	7	60.0	140	37x5	38x5
Pope-Hartford 27.	Touring...	3000	5	36.1	124	36x4	36x4
Pope-Hartford 27.	Phaeton...	3000	5	36.1	124	36x4	36x4
Pope-Hartford 27.	T. Tonneau...	3000	4	36.1	124	36x4	36x4
Pope-Hartford 27.	Roadster...	3000	2	36.1	124	36x4	36x4
Pope-Hartford 27.	Touring...	3250	7	36.1	124	36x4	36x4
Pope-Hartford 27.	Limousine.	4150	7	36.1	124	36x4	36x4
Pope-Hartford 27.	Landulet...	4150	7	36.1	124	36x4	36x4
Pope-Hartford 27.	Berline...	4400	7	36.1	124	36x4	36x4
Pope-Hartford 28.	Touring...	4000	7	44.6	134	38x4	39x5
Pope-Hartford 28.	Phaeton...	4000	5	44.6	134	38x4	39x5
Pope-Hartford 28.	T. Tonneau...	4000	4	44.6	134	38x4	39x5
Pope-Hartford 28.	Roadster...	4000	2	44.6	134	38x4	39x5
Pope-Hartford 28.	Limousine.	5150	7	44.6	134	38x4	39x5
Pope-Hartford 28.	Landulet...	5150	7	44.6	134	38x4	39x5
Pope-Hartford 28.	Berline...	5400	7	44.6	134	38x4	39x5
Premier M-4.	Touring...	3000	5	32.4	126	36x4	36x4
Premier M-4.	Roadster...	3000	2	32.4	126	36x4	36x4
Premier M-4.	Clubman...	3000	5	32.4	126	36x4	36x4
Premier M-4.	Limousine.	4200	7	32.4	126	36x4	36x4
Premier M-4.	Berline...	5200	7	32.4	126	36x4	36x4
Premier M-6.	Touring...	3750	7	48.6	140	36x4	36x4
Premier M-6.	Clubman...	3750	5	48.6	140	36x4	36x4
Premier M-6.	Roadster...	3750	2	48.6	140	36x4	36x4
Premier M-6.	Limousine.	5000	7	48.6	140	36x4	36x4
Premier M-6.	Berline...	6000	7	48.6	140	36x4	36x4
Rambler Metropol.	Limousine.	4200	7	60.0	128	40x4	40x4
Schlusser 1912.	Touring...	4500	7	60.0	126	36x4	36x4
Schlusser 1912.	Runabout...	4200	5	60.0	126	36x4	36x4
Schlusser 1912.	Limousine.	5400	7	60.0	126	36x4	36x4
Selden 47.	Limousine.	3750	7	36.1	125	36x4	36x4
S.G.V., A.	Landulet...	3500	6	22.5	116	34x4	34x4
S.G.V., A.	Limousine.	3500	6	22.5	116	34x4	34x4
S.G.V., D.	Landulet...	3500	6	25.6	118	34x4	34x4



1, Premier Six; 2, National 40; 3, Knox R-45; 4, Speedwell; 5, P. & S. 46; 6, KisselKar 60; 7, Everitt 6-48; 8, Kline 6-50; 9, Chalmers 36; 10, Selden



Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
S.G.V., D.	Limousine	\$3500	6	25.6	118	34x4	34x4
Simplex 38	Touring	4850	4	57.0	127	36x4	36x5
Simplex 38	Touring	4850	5	57.0	127	36x4	36x5
Simplex 38	Touring	4850	7	57.0	127	36x4	36x5
Simplex 38	Limousine	5800	7	57.0	127	36x4	36x5
Simplex 38	Landulet	5800	7	57.0	127	36x4	36x5
Simplex 38	Touring	5700	7	38.0	137	34x4	34x5
Simplex 38	Coach Lim.	6500	7	38.0	137	34x4	34x5
Simplex 38	Coach Land.	6500	7	38.0	137	34x4	34x5
Simplex 38	F'd'r Tour.	5850	7	38.0	137	34x4	34x5
Simplex 38	F'd'r Lim.	6700	7	38.0	137	34x4	34x5
Simplex 38	F'd'r Land.	6700	7	38.0	137	34x4	34x5
Simplex 50	Touring	5600	5	53.0	124	36x4	36x5
Simplex 50	Touring	5700	7	53.0	124	36x4	36x5
Simplex 50	Touring	5600	4	53.0	124	36x4	36x5
Simplex 50	Runabout	5300	2	53.0	124	36x4	36x5
Simplex 50	T. Tonneau	5400	4	53.0	124	36x4	36x5
Simplex 50	Limousine	6400	7	53.0	129	36x4	36x5
Simplex 50	Landulet	6400	7	53.0	129	36x4	36x5
Simplex 50	Touring	6200	7	53.0	139	36x5	36x5
Simplex 50	F'd'r Tour.	6350	7	53.0	139	36x5	36x5
Spoerer 40-C	F'd'r Tour.	3000	5	38.0	120	x4	x4
Spoerer 40-C	F'd'r Tour.	3250	7	38.0	120	x4	x4
Spoerer 40-C	Limousine	4000	7	38.0	120	x4	x4
Spoerer 40-C	Landulet	4150	7	38.0	120	x4	x4
St'ns-Knight Run.	Roadster	3500	3	28.9	116	36x4	36x4
St'ns-Knight Run.	T. Tonneau	3500	4	28.9	116	36x4	36x4
St'ns-Knight Reg.	Touring	3500	5	28.9	121	36x4	36x4
St'ns-Knight Reg.	Limousine	4800	7	28.9	121	36x4	36x4
St'ns-Knight Reg.	Landulet	4700	7	28.9	121	36x4	36x4
Stevens-Duryea X	Limousine	4000	7	36.1	124	34x4	34x4
Stev.-Duryea AA	F'd'r Tour.	3750	5	43.8	128	36x4	37x4
Stev.-Duryea AA	F'd'r Tour.	3900	7	43.8	128	36x4	37x5
Stev.-Duryea AA	Torpedo	3850	5	43.8	128	36x4	37x4
Stev.-Duryea AA	Tour. Road.	3750	4	43.8	128	36x4	37x4
Stev.-Duryea AA	Runabout	3750	2	43.8	128	36x4	37x4
Stev.-Duryea AA	Limousine	3750	7	43.8	128	36x4	37x5
Stev.-Duryea AA	Landulet	4950	7	43.8	128	36x4	37x5
Stev.-Duryea AA	Berline	5000	7	43.8	128	36x4	37x5

## \$2500 Class—Cars That

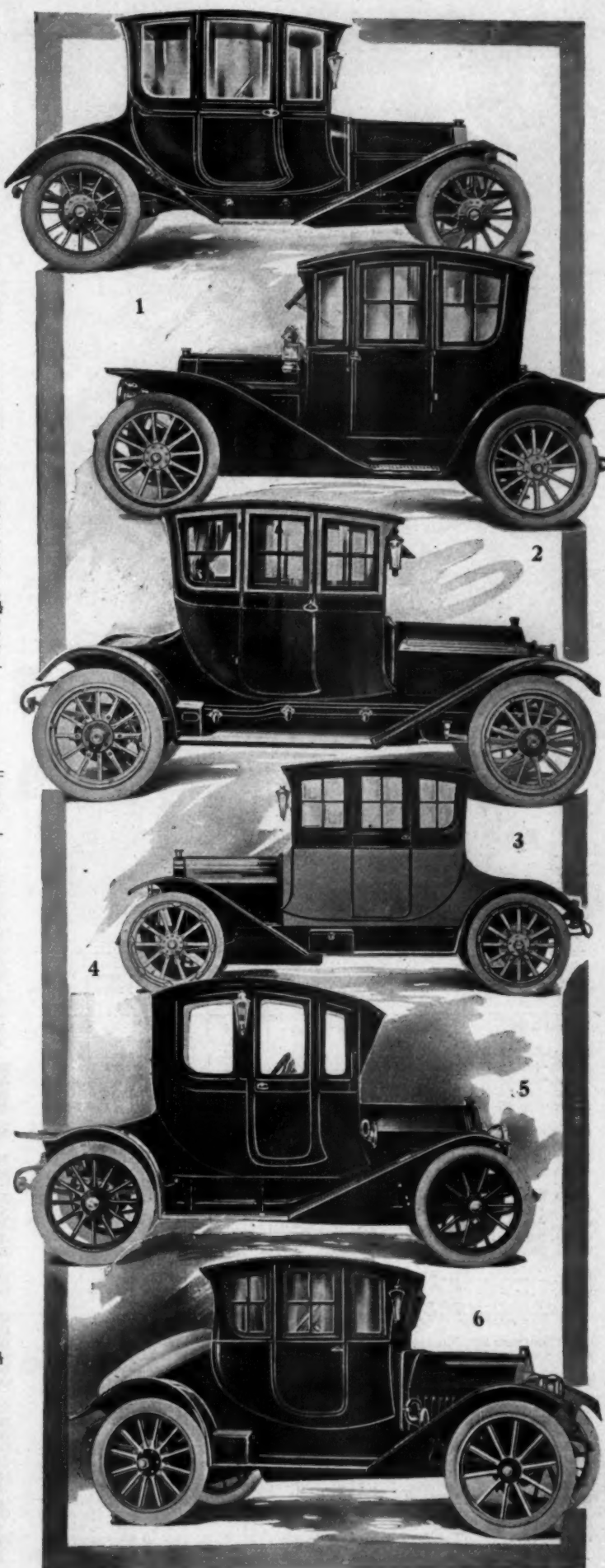
Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Abbott-Detroit 30	Coupe	\$2150	3	27.3	110	34x3	34x3
Abbott-Detroit 44	Touring	1800	7	32.4	120	36x4	36x4
Abbott-Detroit 44	F'd'r Tour.	1800	7	32.4	120	36x4	36x4
American 30	F'd'r Tour.	2250	4	32.4	118	37x4	37x4
American 30	F'd'r Road.	2250	2	32.4	118	37x4	37x4
Amplex H-K	Roadster	4500	2	41.6	128	36x4	37x5
Amplex H-K	Tcy tonn'u.	4500	5	41.6	128	36x4	37x5
Amplex H-K	Touring	4500	7	41.6	128	36x4	37x5
Amplex H-K	Limousine	5800	7	41.6	128	36x4	37x5
Amplex Baby	Touring	2250	5	32.4	120	34x4	34x4
Amplex Baby	Roadster	2250	2	32.4	120	34x4	34x4
Apperson 450	Touring	2000	5	36.1	118	36x4	36x4
Atlas O	Runabout	2200	2		128	36x4	36x4
Atlas O	Touring	2400	5		128	36x4	36x4
Autocar 24-B	Touring	2650	5	30.6	117	37x4	37x4
Autocar 24-B	F'd'r Tour.	2750	5	30.6	117	37x4	37x4
Babcock H	Touring	2500	5	27.3	114	34x4	34x4
Bergdoll C	Coupe	2100	2	25.6	115	34x3	34x3
Bergdoll D	Touring	1900	5	25.6	115	36x4	36x4
Bergdoll D	Torpedo	1900	4	25.6	115	36x4	36x4
Bergdoll D	Coupe	2500	2	25.6	115	36x4	36x4
Berkshire E	Runabout	2800	2	39.0	124	36x4	36x4
Berkshire E	T. Tonneau	2800	5	39.0	124	36x4	36x4
Berkshire E	Torpedo	2900	5	39.0	124	36x4	36x4
Berkshire E	Touring	2900	7	39.0	124	36x4	36x4
Buick 43	F'd'r Tour.	1800	5	32.4	116	36x4	36x4
Cadillac 1912	Touring	1800	5	32.4	116	36x4	36x4
Cadillac 1912	Phaeton	1800	4	32.4	116	36x4	36x4
Cadillac 1912	Roadster	1800	2	32.4	116	36x4	36x4
Cadillac 1912	Torpedo	1900	4	32.4	116	36x4	36x4
Cadillac 1912	Coupe	2250	4	32.4	116	36x4	36x4
Carhartt B	Touring	2500	5	38.0	118	34x4	34x4
Carhartt B	Roadster	2500	2	38.0	118	34x4	34x4
Carhartt B	Demi-tonn.	2500	5	38.0	118	34x4	34x4
Cartercar S	Touring	2100	7	32.4	122	36x4	36x4
Case 30	Torpedo	1850	4	28.9	116	34x4	34x4
Case 30	Fore-door	1850	5	28.9	116	34x4	34x4
Case 30	Coupe	2450	3	28.9	116	34x4	34x4
Case 30	Limousine	2850	7	28.9	116	34x4	34x4
Case 40	Roadster	1900	2	32.4	120	36x4	36x4
Case 40	Torpedo	2050	4	32.4	120	36x4	36x4

1, Packard; 2, Selden; 3, Franklin; 4, Premier; 5, Speedwell; 6, National

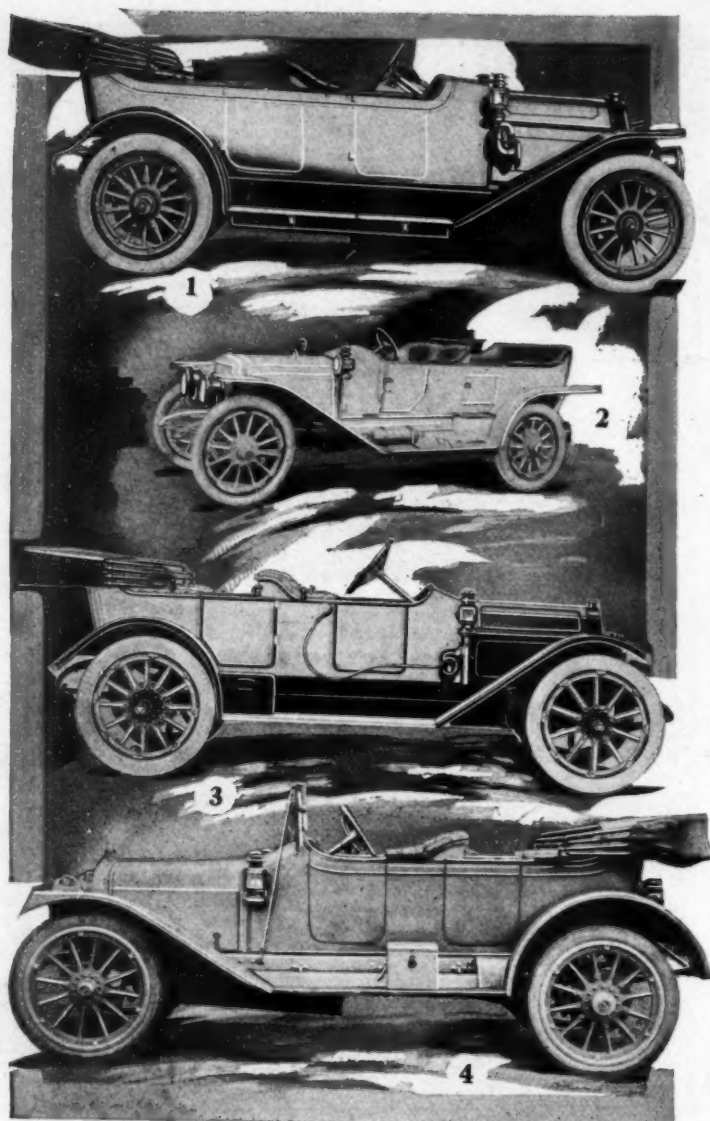
Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Stev.-Duryea Y....	F'd'r Tour..	\$4000	7	54.1	142	36x4	36x5
Stev.-Duryea Y....	Limousine..	5150	7	54.1	142	36x4	36x5
Stod.-Day. Sayb'k.	Limousine..	3900	7	36.1	122	36x5	36x5
Stod.-Day. Special	Roadster....	3300	2	40.0	122	36x4	36x4
Stod.-Day. Special	Torpedo....	3300	4	40.0	122	36x4	36x4
Stod.-Day. Special	Touring....	3500	7	40.0	130	36x5	36x5
Stod.-Day. Special	Torpedo....	3500	6	40.0	130	36x5	36x5
Stod.-Day. Special	Limousine..	4600	7	40.0	130	37x5	37x5
Stod.-Day. Knight	Touring....	5000	7	48.6	133	36x5	36x5
Stod.-Day. Knight	Torpedo....	4900	4	48.6	133	36x5	36x5
Stod.-Day. Knight	Roadster....	4900	2	48.6	133	36x4	36x4
Stod.-Day. Knight	Limousine..	6250	7	48.6	133	37x5	37x5
Stuyvesant 50....	Touring....	4200	7	38.0	126	36x4	36x4
Stuyvesant .....	Touring....	4200	5	38.0	126	36x4	36x4
Stuyvesant .....	Torpedo....	4200	4	38.0	126	36x4	36x4
Thomas 6-40....	Touring....	4000	7	43.8	134	36x4	37x5
Thomas 6-40....	Phaeton....	4000	5	43.8	134	36x4	37x5
Thomas 6-40....	Surrey....	4000	4	43.8	134	36x4	37x5
Thomas 6-40....	Runabout..	4000	2	43.8	134	36x4	36x4
Velie Special....	Limousine..	3750	7	32.4	121	36x4	36x4
Virginian A-50....	F'd'r Tour..	3000	7	40.0	130	40x4	40x4
White G-B.....	Limousine..	3800	5	22.5	120	34x4	34x4
White G-B.....	Landaulet..	3800	5	22.5	120	34x4	34x4
White G-E.....	Touring....	3300	5	36.1	120	36x4	36x4
White G-E.....	Touring....	3500	7	36.1	120	36x4	36x4
White G-E.....	Roadster....	3300	2	36.1	120	36x4	36x4
White G-E.....	Limousine..	4700	5	36.1	120	36x4	36x4
White G-E.....	Landaulet..	4700	5	36.1	120	36x4	36x4
White G-E.....	Berline....	5000	7	36.1	120	36x4	36x4
Winton 17-C....	Touring....	3000	5	48.6	130	36x4	36x4
Winton 17-C....	T. Tonneau..	3000	4	48.6	130	36x4	36x4
Winton 17-C....	Limousine..	4350	7	48.6	130	36x4	36x4
Winton 17-C....	F'd'r Lim..	4500	7	48.6	130	36x4	36x4
Winton 17-C....	Landaulet..	4500	7	48.6	130	36x4	36x4

## Cost \$1800 to \$2999

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Case 40.....	Fore-door..	\$2050	5	32.4	120	36x4	36x4
Case 40.....	Coupe.....	2650	3	32.4	120	36x4	36x4
Chalmers 30....	Coupe.....	2000	3	25.6	115	34x4	34x4
Chalmers 36....	Touring....	1800	5	28.9	115	36x4	36x4
Chalmers 36....	F'd'r T. T..	1800	4	28.9	115	36x4	36x4
Chalmers 36....	Roadster....	1900	2	28.9	115	36x4	36x4
Cino 4.....	Roadster....	2000	2	30.6	116	34x4	34x4
Cino 4.....	Touring....	2000	4	30.6	116	34x4	34x4
Cino 6.....	Touring....	2750	5	38.4	130	36x4	36x4
Cino 6.....	Touring....	2750	7	38.4	130	36x4	36x4
Coe 1912.....	Touring....	1850	5	38.4	124	36x4	36x4
Coe 1912.....	Roadster....	1850	2	38.4	124	36x4	36x4
Coe 1912.....	Spec. Torp..	2000	5	38.4	124	36x4	36x4
Colby L.....	Coupe.....	2250	3	26.4	116	36x4	36x4
Colby H.....	Torpedo....	2000	5	27.3	121	36x4	36x4
Colby H.....	Coupe.....	2500	3	27.3	121	36x4	36x4
Colby J.....	Runabout..	2000	2	28.9	112	32x4	32x4
Cole 1912.....	Roadster....	2000	2	32.4	122	36x4	36x4
Cole 1912.....	T. Tonneau..	2000	4	32.4	122	36x4	36x4
Cole 1912.....	Touring....	2000	5	32.4	122	36x4	36x4
Cole 1912.....	Coupe.....	2500	3	32.4	122	36x4	36x4
Corbitt.....	Tor. Road..	2000	2	25.6	120	34x4	34x4
Corbitt.....	F'd'r T. T..	2000	4	25.6	120	34x4	34x4
Corbitt.....	F'd'r Tour..	2000	5	25.6	120	34x4	34x4
Corbin 30....	Touring....	2000	5	32.4	115	34x4	34x4
Corbin 30....	Roadster....	2000	2	32.4	115	34x4	34x4
Correja T-R-S..	Limousine..	2300	4	28.9	125	36x4	36x4
Crawford 12-40..	Touring....	2250	4	32.4	123	34x4	34x4
Crawford 12-40..	Touring....	2250	5	32.4	123	34x4	34x4
Crow-Elkhart 59.	F'd'r Tour..	2000	7	30.6	122	37x4	37x4
Crow-Elkhart 59.	Touring....	2000	7	32.4	122	36x4	36x4
Cutting T-55....	Torp. Tour..	1850	5	36.1	116	36x4	36x4
Davis 40.....	F'd'r Torp..	1850	5	27.3	112	36x4	36x4
Davis 40.....	F'd'r Torp..	1850	4	27.3	112	36x4	36x4
Davis 40.....	Torp. Road..	1850	2	27.3	112	36x4	36x4
Dorris G.....	Touring....	2500	5	30.6	115	36x4	36x4
Dorris G.....	Roadster....	2500	2	30.6	115	36x4	36x4
Dorris G.....	Coupe.....	2650	3	30.6	115	36x4	36x4
Everitt 6-48....	Roadster....	1850	2	38.4	127	36x4	36x4
Everitt 6-48....	Touring....	1850	5	38.4	127	36x4	36x4
Everitt 6-48....	Touring....	1900	4	38.4	127	36x4	36x4



1, Overland; 2, Regal; 3, Cole 30; 4, Moon; 5, Abbott-Detroit; 6, Cartercar

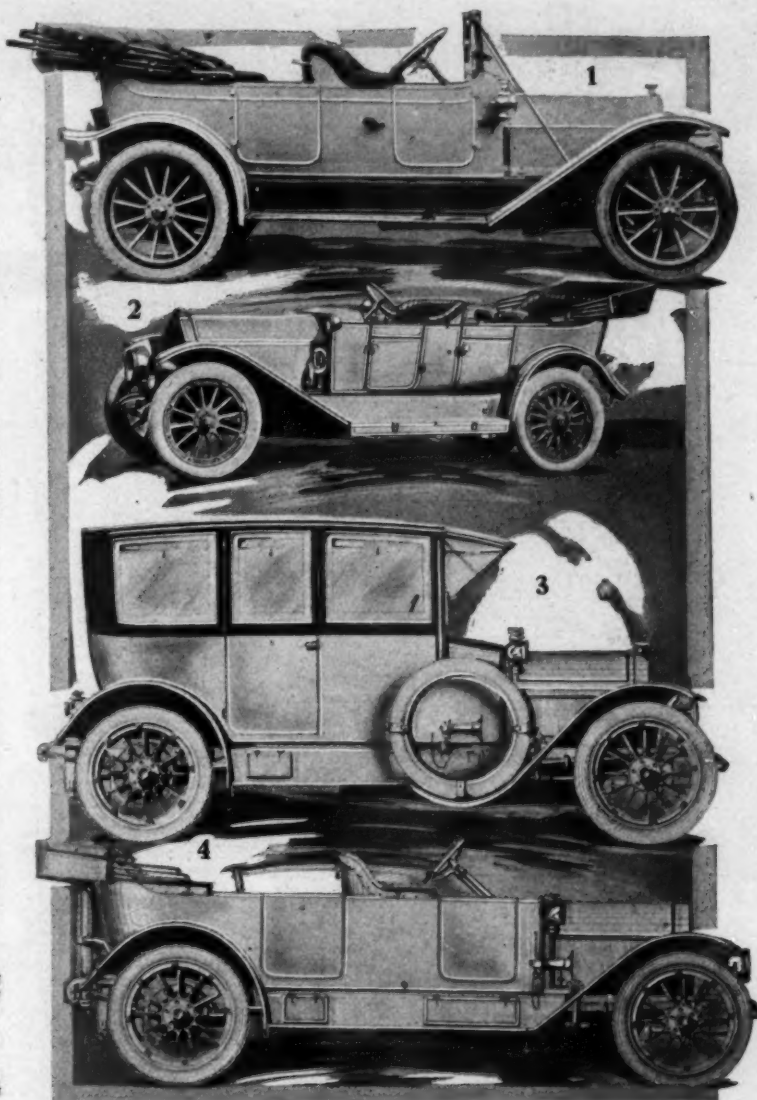


Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Everitt 6-48	Touring	\$1950	6	38.4	127	36x4	36x4
Firest.-Col. 86-D	Roadster		3	27.3	116	34x4	34x4
Firest.-Col. 86-D	Touring		5	27.3	116	34x4	34x4
Firest.-Col. 60-D	Touring		5	32.4	121	36x4	36x4
Firest.-Col. 69-D	Touring		7	32.4	121	36x4	36x4
Firest.-Col. 69-D	Touring		7	32.4	121	36x4	36x4
Franklin G-Tour	Touring	2000	5	25.6	103	32x4	32x4
Franklin M	Touring	2800	5	31.6	116	34x4	34x4
Franklin M	Roadster	2800	2	31.6	116	34x4	34x4
Franklin M	Torp. Phae.	2800	4	31.6	116	34x4	34x4
G.J.G. Senior	Speedster	2250	2	36.1	121	34x4	34x4
G.J.G. Senior	Pirate	2500	2	36.1	121	34x4	34x4
G.J.G. Senior	Scout	2500	4	36.1	121	34x4	34x4
G.J.G. Senior	Comfort	2500	5	36.1	121	34x4	34x4
G.J.G. Senior	Touring	2750	7	36.1	121	34x4	34x4
Glide	Torp. Road.	2000	2	36.1	120	36x4	36x4
Glide	P'd'r Torp.	2000	4	36.1	120	36x4	36x4
Glide	P'd'r Torp.	2150	5	36.1	120	36x4	36x4
Glide	P'd'r Torp.	2250	7	36.1	120	40x4	40x4
Great Southern 50	Touring	2750	7	42.0	128	-x4	-x4
Great Southern 50	Roadster	2650	2	42.0	128	-x4	-x4
Grout 35	Pore-door	2000	5	32.4	116	34x4	34x4
Grout 35	Torp. Road.	2000	2	32.4	116	34x4	34x4
Grout 45	Pore-door	2500	5	36.1	123	36x4	36x4
Grout 45	Pore-door	2850	7	36.1	123	36x4	36x4
Halladay 40	Touring	2000	5	32.4	119	36x4	36x4
Halladay 40	T. Tonneau	2000	4	32.4	119	36x4	36x4
Halladay 40	Roadster	2000	2	32.4	119	36x4	36x4
Halladay 50	Touring	2750	7	36.1	128	36x4	36x4
Halladay 50	T. Tonneau	2750	4	36.1	128	36x4	36x4
Haynes 20	Roadster	1800	2	28.9	114	34x4	34x4
Haynes 20	Touring	1850	4	28.9	114	34x4	34x4

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Haynes 20	Touring	\$1850	5	28.9	114	34x4	34x4
Haynes 21	Touring	2100	5	32.4	120	36x4	36x4
Haynes 21	Coupe	2100	4	32.4	120	36x4	36x4
Haynes 21	Coupe	2450	4	32.4	120	36x4	36x4
Haynes 21	Limousine	2750	7	32.4	120	36x4	36x4
Havers 6-44	Touring	1850	5	33.8	122	36x4	36x4
Havers 6-44	Roadster	1850	2	33.8	122	36x4	36x4
Imperial 50	Touring	1850	5	36.1	118	34x4	34x4
Imperial 51	Roadster	1850	4	36.1	118	34x4	34x4
Inter-State 40	P'd'r Tour	2400	5	32.4	118	36x4	36x4
Inter-State 41	P'd'r D-Ton	2400	4	32.4	118	36x4	36x4
Inter-State 42	Roadster	2400	2	32.4	118	36x4	36x4
Jackson 52	Touring	1800	5	36.1	124	36x4	36x4
Jenkins 50	Touring	2750	5	36.1	118	36x4	36x4
Jenkins 50	Pore-door	2850	5	36.1	118	36x4	36x4
Johnson B	P'd'r Tour	2500	5	32.4	112	36x4	36x4
Johnson B	Touring	2400	5	32.4	112	36x4	36x4
Jonz D	Touring	2100	5	32.4	120	36x4	36x4
Jonz D	Demi-tonn	2000	4	32.4	120	36x4	36x4
Jonz D	Roadster	2000	2	32.4	120	36x4	36x4
Jonz D	Coupe	2200	2	32.4	120	36x4	36x4
King 36	Coupe	2165	3	23.2	115	34x4	34x4
Kisselkar 40	P'd'r S-Ton	1850	5	32.4	118	35x4	35x4
Kisselkar 40	P'd'r Racer	1850	2	32.4	118	35x4	35x4
Kisselkar 50	P'd'r Tour	2350	5	38.0	124	36x4	36x4
Kisselkar 50	P'd'r S-Tour	2350	5	38.0	124	36x4	36x4
Kisselkar 50	P'd'r Racer	2350	2	38.0	124	36x4	36x4
Klinekar 4-40	Touring	2250	5	28.9	118	36x4	36x4
Klinekar	T. Tonneau	2250	4	28.9	118	36x4	36x4
Klinekar	Roadster	2250	2	28.9	118	36x4	36x4
Klinekar 6-60	Touring	2850	5	39.5	126	36x4	36x4
Klinekar 6-60	T. Tonneau	2850	4	39.5	126	36x4	36x4
Klinekar 6-60	Meteor	2850	2	39.5	126	36x4	36x4
Leader 40	P'd'r Tour	1800	5	32.4	124	36x4	36x4
Lenox	Touring	1800	5	27.3	116	34x4	34x4
Lenox	A B	1900		27.3	116	34x4	34x4
Lenox	Touring	1800	4	27.3	116	34x4	34x4
Lenox	Roadster	1800	3	27.3	116	34x4	34x4
Lenox	Runabout	1800	2	27.3	116	34x4	34x4
Lenox	Limousine	2750	7	27.3	116	34x4	34x4
Lexington F	Touring	1975	5	32.4	122	36x4	36x4
Lexington F	Demi-ton	1975	5	32.4	122	36x4	36x4
Lexington F	Coupe	2500	3	32.4	122	36x4	36x4
Luverne 540	Touring	1850	5	30.6	124	34x4	34x4
Marathon N-50	Touring	1800	5	32.4	121	36x4	36x4
Marathon N-50	Roadster	1800	4	32.4	121	36x4	36x4
Marmon 32	Touring	2750	5	32.4	120	35x4	35x4
Marmon 32	Suburban	2750	4	32.4	120	35x4	35x4
Marmon 32	Roadster	2750	2	32.4	120	35x4	35x4
McFarlan 40-45	P'd'r Tour	2100	5	38.4	124	36x4	36x4
McFarlan 40-45	Torpedo	2100	4	38.4	124	36x4	36x4
McFarlan 55-60	Torpedo	2750	4	48.6	128	37x4	37x4
McFarlan 55-60	P'd'r Tour	2750	7	48.6	128	37x4	37x4
Mercer 35R	Raceabout	2500	2	30.6	108	32x4	32x4
Mercer 35R	Runabout	2500	2	30.6	108	32x4	32x4
Mercer 35A	P'd'r Tour	2750	4	32.4	118	34x4	34x4
Mercer 35A	P'd'r Tour	2750	5	32.4	118	34x4	34x4
Midland L3	P'd'r Tour	2000	5	32.4	115	34x4	34x4
Midland L3	P'd'r Road	1900	2	32.4	115	34x4	34x4
Midland L3	T. Tonneau	2000	4	32.4	115	34x4	34x4
Midland R	P'd'r Tour	2750	5	32.4	118	35x4	35x4
Mitchell 7-6	P'd'r Tour	2250	7	48.6	135	36x4	36x4
Moon 30	Limousine	2750	7	32.4	115	34x4	34x4
Moon 40	Coupe	2250	4	32.4	120	36x4	36x4
National Series V	P'd'r Tour	2900	5	38.0	125	36x4	36x4
National Series V	P'd'r T. To	2900	4	38.0	125	36x4	36x4
National Series V	Roadster	2750	2	38.0	120	34x4	34x4
National Roadster	Roadster	2500	2	40.0	124	36x4	36x4
National Touring	Touring	2600	5	40.0	124	36x4	36x4
Oakland 40	Coupe	1900	3	27.2	112	34x4	34x4
Oakland 45	Touring	2100	7	32.4	120	36x4	36x4
Ohio Regular	Torpedo	2500	5	32.4	115	36x4	36x4
Ohio Regular	P'd'r Tour	2500	5	32.4	115	36x4	36x4
Ohio Regular	Roadster	2500	2	32.4	115	36x4	36x4
Ohio Regular	Coupe	2750	4	32.4	115	36x4	36x4
Ohio Regular	Cl. Coupled	2250	4	32.4	115	36x4	36x4
Ohio Regular	Speedster	2250	2	39.0	105	32x4	32x4
Otto	Demi-tonn	1850	4	28.9	123	34x3	34x3
Otto	Roadster	1850	3	28.9	123	34x3	34x3
Otto	Touring	2000	5	28.9	123	34x3	34x3
Otto	Torpedo	2000	4	28.9	123	34x3	34x3
Otto	Roadster	2000	2	28.9	123	34x3	34x3
Otto	Coupe	2850	3	28.9	123	34x3	34x3
Overland 61	Torp. Road	2000	3	30.6	118	34x4	34x4
Overland 61	Coupe	2000	3	30.6	118	34x4	34x4
Palm'r-Singer 6-40	Touring	2000	5	38.4	126	34x4	34x4

1, Stoddard-Dayton Torpedo; 2, Lozier 46; 3, Hudson Torpedo; 4, Corbin Torpedo

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Palm'r-Singer 6-40	Touring...	\$2000	4	38.4	126	34x4	34x4
Palm'r-Singer 6-40	Runabout...	2000	2	38.4	126	34x4	34x4
Palm'r-Singer 46	Touring...	2700	7	38.4	126	36x4	36x4
Palm'r-Singer 46	Touring...	2500	5	38.4	126	36x4	36x4
Palm'r-Singer 46	Runabout...	2500	2	38.4	126	36x4	36x4
Paterson 45	Touring...	1800	5	32.4	120	36x4	36x4
Pathfinder 40	Coupe...	2250	4	27.2	118	34x—	34x—
Pratt 40	Roadster...	1900	2	32.4	120	36x4	36x4
Pratt 40	Demi-tonn...	2000	4	32.4	120	36x4	36x4
Pratt 40	Touring...	2000	5	32.4	120	36x4	36x4
Pratt 40	Touring...	2100	7	32.4	120	36x4	36x4
Pullman 4-40	Touring...	2150	5	32.4	122	36x4	36x4
Pullman 6-60	P'd'r Tour...	2750	7	48.6	136	36x4	36x4
Rambler Cr. Coun.	Coupe...	2500	4	32.4	120	36x4	36x4
Rambler Cr. Coun.	Limousine...	2750	5	32.4	120	36x4	36x4
Rambler Coun. Cl.	Touring...	2250	5	40.0	120	36x4	36x4
Rambler Coun. Cl.	T. Tonneau...	2250	4	40.0	120	36x4	36x4
Rambler Moraine	Touring...	2500	7	40.0	128	40x4	40x4
Rambler Moraine	T. Tonneau...	2500	6	40.0	128	40x4	40x4
Rambler Metropol.	Touring...	2850	7	40.0	128	40x4	40x4
Rambler Metropol.	Torpedo...	2850	6	40.0	128	40x4	40x4
Rayfield C.	Roadster...	2500	2	37.2	117	34x—	34x—
Rayfield C.	Pore-door...	2500	5	37.2	117	34x—	34x—
Republic 111-112-113	Touring...	2250	5	28.9	120	36x4	36x4
Republic 111-112-113	T. Tonneau...	2250	4	28.9	120	36x4	36x4
Republic 111-112-113	Roadster...	2250	2	28.9	120	36x4	36x4
Sebring 6	Torpedo...	2750	4	37.2	122	36x4	36x4
Selden 47	Touring...	2500	5	36.1	125	36x4	36x4
Selden 47	Touring...	2600	7	36.1	125	36x4	36x4
Selden 47	Torpedo...	2500	4	36.1	125	36x4	36x4
Selden 47	Roadster...	2500	2	36.1	125	36x4	36x4
S.G.V., A.	Touring...	2500	5	22.5	116	34x4	34x4
S.G.V., A.	Runabout...	2500	2	22.5	116	34x4	34x4
S.G.V., A.	Torpedo...	2500	4	22.5	116	34x4	34x4
S.G.V., D.	Touring...	2500	5	25.6	118	34x4	34x4
S.G.V., D.	Runabout...	2500	2	25.6	118	34x4	34x4
S.G.V., D.	Torpedo...	2500	4	25.6	118	34x4	34x4
Speedwell 12	Semi-racer...	2500	2	40.0	121	—x4	—x4
Speedwell 12	Torpedo...	2700	4	40.0	121	—x4	—x4
Speedwell 12	Semi-racer...	2700	4	40.0	121	—x4	—x4
Speedwell 12	P'd'r Tour...	2750	5	40.0	121	—x4	—x4
Speedwell 12	P'd'r Tour...	2900	7	40.0	121	—x4	—x4
Spoerer 25-A	Roadster...	2000	2	27.2	120	34x4	34x4
Spoerer 25-A	Touring...	2000	4	27.2	120	34x4	34x4
Spoerer 25-A	Touring...	2000	5	27.2	120	34x4	34x4
Spoerer 25-A	Town Car...	2500	5	27.2	120	34x4	34x4
Spoerer 40-C	Roadster...	2950	2	38.0	120	—x4	—x4
Stafford	P'd'r Tour...	2350	5	27.2	112	34x4	34x4
Stafford	Touring...	2250	5	27.2	112	34x4	34x4
Standard A	Touring...	1800	5	28.9	110	34x3	40x3
Staver 35-F	P'd'r Tour...	1850	5	32.4	120	36x4	36x4
Staver 40-F	P'd'r Tour...	2000	7	32.4	124	36x4	36x4
Staver 40-R-R	Torpedo...	2000	4	32.4	124	36x4	36x4
Stevens-Duryea X	P'd'r Tour...	2850	5	36.1	124	34x4	34x4
Stevens-Duryea X	Tour. Road...	2850	4	36.1	124	34x4	34x4
Stod.-Day. Stratf.	Limousine...	2750	7	28.9	114	35x4	35x4
Stod.-Day. Stratf.	Landaulet...	2750	7	28.9	114	15x4	35x4
Stod.-Day. Stratf.	Coupe...	2350	3	28.9	114	35x4	35x4
Stod.-Day. Sayb'k	Touring...	2800	7	36.1	122	36x4	36x4
Stod.-Day. Sayb'k	Torpedo...	2700	4	36.1	122	36x4	36x4
Stod.-Day. Sayb'k	Roadster...	2700	2	36.1	122	36x4	36x4
Stutz A.	Roadster...	2000	2	36.1	120	34x4	34x4
Stutz A.	Touring...	2000	4	36.1	120	34x4	34x4
Stutz A.	Touring...	2000	5	36.1	120	34x4	34x4
Stutz A.	Coupe...	2500	4	36.1	120	34x4	34x4
Suburban Limited	P'd'r Tor...	2	29.4	110	34x3	34x3	
Suburban	P'd'r Road...	3	29.4	110	34x3	34x3	
Suburban	P'd'r Tour...	4	29.4	110	34x3	34x3	
Suburban	P'd'r P. C.	5	29.4	110	34x4	34x4	
Triumph	Roadster...	2250	2	28.9	118	36x4	36x4



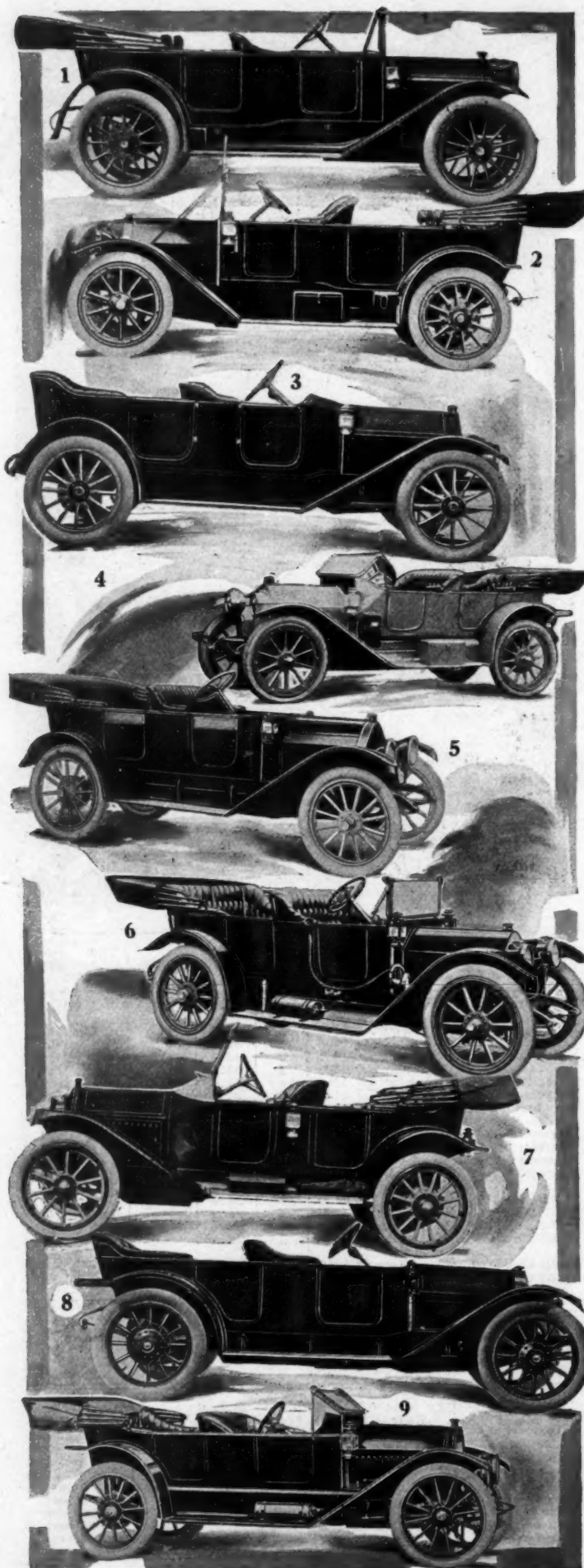
Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Triumph	Touring...	\$2500	5	28.9	118	36x4	36x4
Vellie G.	P'd'r Tour...	2100	5	32.4	115	34x4	34x4
Vellie G.	Doc. Special	1900	2	32.4	115	34x4	34x4
Vellie G.	Racytype...	2000	2	32.4	115	34x4	34x4
Vellie Standard	Touring...	2200	5	32.4	118	36x4	36x4
Vellie Standard	Torpedo...	2200	4	32.4	118	36x4	36x4
Vellie Standard	Roadster...	2200	2	32.4	118	36x4	36x4
Vellie Special	Touring...	2750	6	32.4	121	36x4	36x4
Westcott K.	Touring...	1800	5	32.4	120	36x4	36x4
Westcott L.	L.	1800	4	32.4	120	36x4	36x4
Westcott M.	Roadster...	1800	2	32.4	120	36x4	36x4
Westcott R.	P'd'r Tour...	2250	7	36.1	120	36x4	36x4
W.F.S., B.	Touring...	2450	5	32.4	118	36x4	36x4
W.F.S., B.	Gunboat...	2500	4	32.4	118	36x4	36x4
W.F.S., B.	Roadster...	2450	3	32.4	118	36x4	36x4
W.F.S., B.	Roadster...	2350	2	32.4	118	36x4	36x4
White G-A-D	Torp. Tour...	2250	5	22.5	110	34x4	34x4
White G-A-D	Roadster...	2250	2	22.5	110	34x4	34x4

### \$1500 Class—Cars Costing \$1250 to \$1799

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Abbott-Detroit 30	Runabout...	\$1275	2	27.3	110	34x3	34x3
Abbott-Detroit 30	P'd'r Tour...	1350	5	27.3	110	34x3	34x3
Abbott-Detroit 44	Runabout...	1775	2	32.4	120	36x4	36x4
Alpena 40	P'd'r Road...	1600	2	27.3	120	36.4	36.4
Alpena 40	Det'a. h. Ton.	1600	4	27.3	120	36.4	36.4
Alpena 40	P'd'r Tour...	1600	5	27.3	120	36.4	36.4

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
American 20	Roadster...	\$1250	2	22.5	105	36x3	36x3
Ames 42	Roadster...	1600	2	27.3	116	36x4	36x4
Ames 42	P'd'r Tour...	1600	5	27.3	116	36x4	36x4
Apperson 4-45	Touring...	1600	5	32.4	114	34x4	34x5
Apperson 4-45	Roadster...	1750	2	32.4	114	34x4	34x5

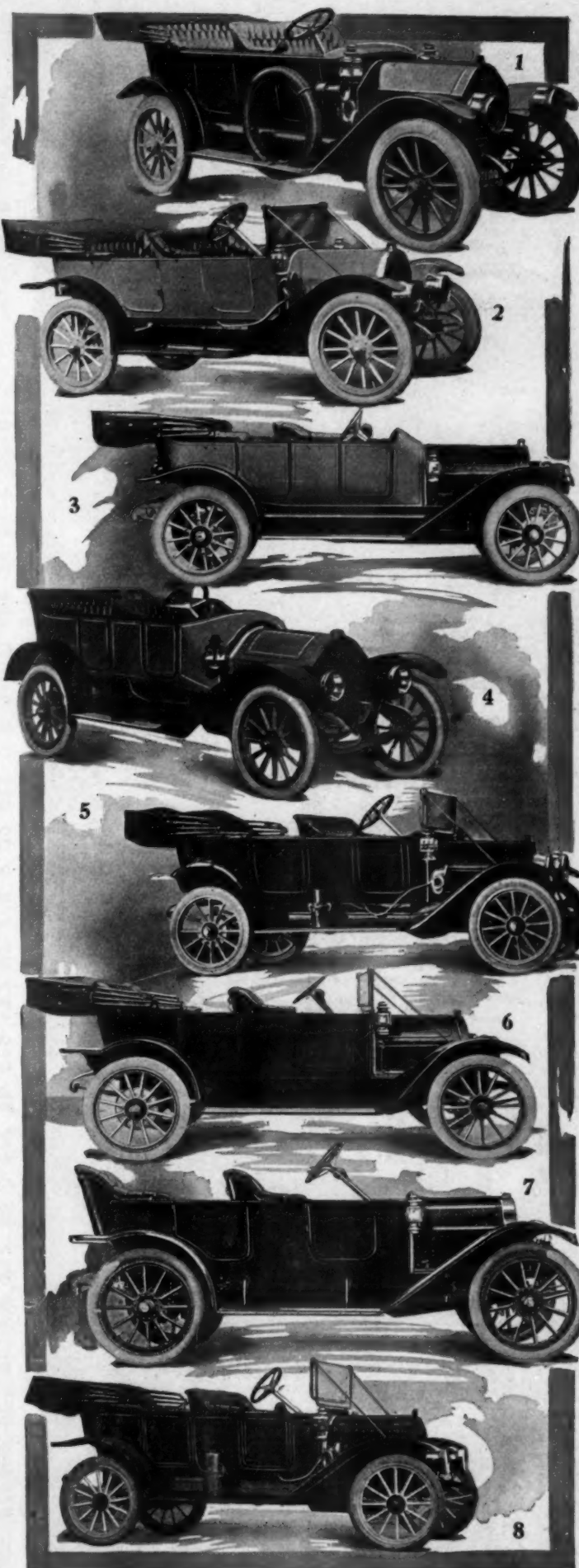
1, Pierce-Arrow; 2, Stoddard-Dayton K; 3, Columbia-Knight coach; 4, Columbia-Knight touring car



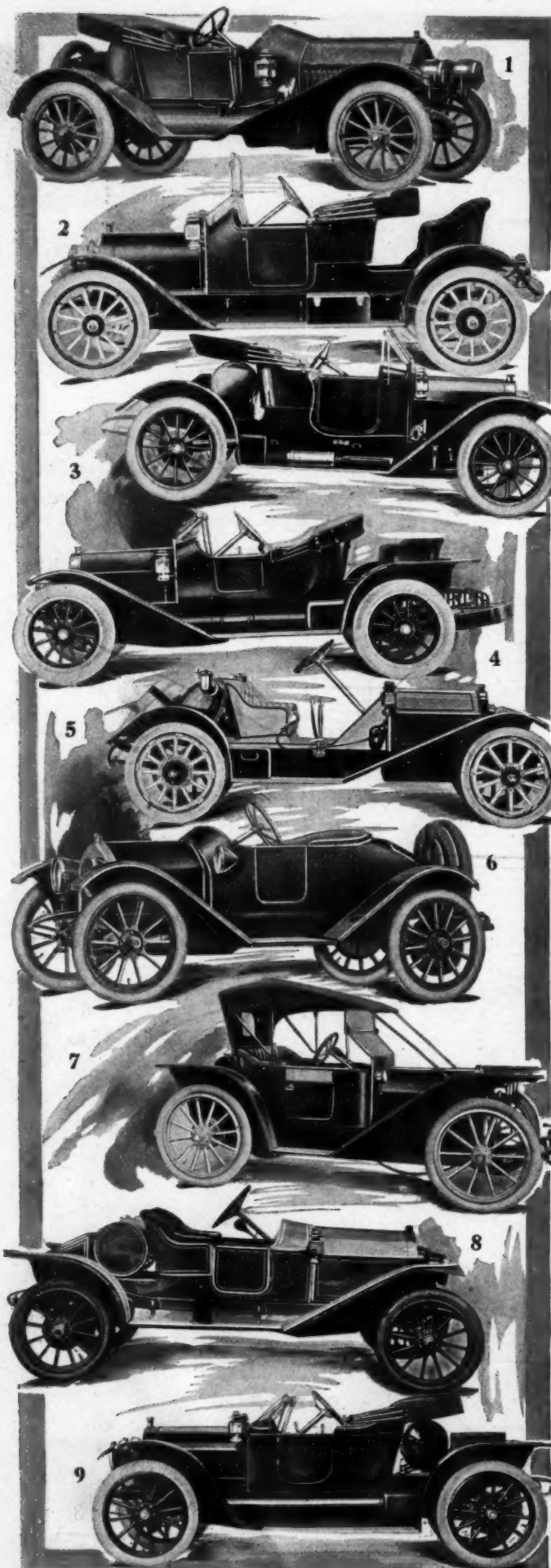
Name and Model	Body?	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Arbenz 40.....	Roadster...	\$1675	2	27.3	120	36x4	36x4
Arbenz 40.....	Torpedo....	1700	4	27.3	120	36x4	36x4
Arbenz 40.....	Touring....	1750	5	27.3	120	36x4	36x4
Auburn 30-L.....	P'd'r Tour..	1400	5	27.3	116	34x3	34x3
Auburn 40-M.....	P'd'r Tour..	1650	5	32.4	120	36x4	36x4
Auburn 40-M.....	P'd'r Road..	1750	2	32.4	120	36x4	36x4
Auburn 40-M.....	Det. P'd'r..	1750	5	32.4	120	36x4	36x4
Bergdoll C.....	Roadster...	1500	3	25.6	115	34x3	34x3
Bergdoll C.....	T. Tonneau..	1500	4	25.6	115	34x3	34x3
Bergdoll C.....	Touring....	1500	5	25.6	115	34x3	34x3
Buick 29.....	P'd'r Tour..	1250	5	25.6	108	34x3	34x3
Cameron 29.....	Fore-door...	1250	5	24.0	110	32x3	32x3
Cameron 30.....	Fore-door...	1250	2	36.1	114	34x3	34x3
Cameron 32.....	Fore-door...	1550	5	36.1	120	34x3	34x3
Carhartt J.....	Runabout...	1350	3	26.4	108	34x3	34x3
Carhartt J.....	Touring....	1350	5	26.4	108	34x3	34x3
Cartercar R.....	Roadster...	1500	2	27.3	112	36x4	36x4
Cartercar R.....	Touring....	1600	5	27.3	112	36x4	36x4
Cartercar R.....	Coupe.....	1700	3	27.3	112	36x4	36x4
Case 30.....	Roadster...	1750	2	28.9	116	34x4	34x4
Chalmers 30.....	Roadster...	1500	2	25.6	115	34x—	34x—
Chalmers 30.....	Pony Tonn..	1500	4	25.6	115	34x—	34x—
Chalmers 30.....	Touring....	1500	5	25.6	115	34x—	34x—
Clark E.....	Torp. Road..	1250	2	27.3	116	34x3	34x3
Clark E.....	P'd'r Tour..	1250	5	27.3	116	34x3	34x3
Clark G.....	P'd'r Tour..	1400	5	27.3	120	34x3	34x3
Colby L.....	Roadster...	1250	2	26.4	116	36x4	36x4
Colby L.....	Touring....	1250	5	26.4	116	36x4	36x4
Colby H.....	Roadster...	1750	2	27.3	121	36x4	36x4
Colby H.....	Racing.....	1750	2	27.3	121	36x4	36x4
Colby H.....	Touring....	1750	5	27.3	121	36x4	36x4
Correja A-B-C.....	Runabout...	1450	2	28.9	105	34x3	34x3
Correja A-B-C.....	Coupe.....	1750	2	28.9	105	34x3	34x3
Correja T-R-S.....	Torp. Tour..	1650	4	28.9	125	36x4	36x4
Crawford 12-30.....	Roadster...	1400	2	27.3	115	34x3	34x4
Crawford 12-30.....	Touring....	1500	4	27.3	115	34x3	34x4
Crawford 12-30.....	Touring....	1500	5	27.3	115	34x3	34x4
Crawford 12-35.....	Touring....	1650	4	25.6	120	34x4	34x4
Crawford 12-35.....	Touring....	1650	5	25.6	120	34x4	34x4
Crow-Elkhart 52.....	Touring....	1250	5	25.6	113	32x3	32x3
Crow-Elkhart 55.....	Touring....	1450	5	27.3	116	34x3	34x3
Crow-Elkhart 56.....	P'd'r Tour..	1600	5	30.6	122	37x4	37x4
Crow-Elkhart 56.....	P'd'r Tour..	1750	5	30.6	122	37x4	37x4
Crow-Elkhart 58.....	Touring....	1750	5	32.4	122	36x4	36x4
Cutting A-30.....	Torp. Tour..	1250	5	25.6	116	34x4	34x4
De Tamble K-L-M.....	Torp. Tour..	1250	5	28.9	116	34x4	34x4
De Tamble K-L-M.....	Torp. Tour..	1500	5	28.9	116	34x4	34x4
Elmore R-27.....	Touring....	1250	5	.....	108	32x3	32x3
Elmore 37.....	Demi-tonn..	1600	4	.....	114	34x4	34x4
Elmore 37.....	Touring....	1600	5	.....	114	34x4	34x4
Everitt 30.....	Touring....	1250	5	25.6	110	34x3	34x3
Everitt 30.....	Roadster...	1250	2	25.6	110	34x3	34x3
Everitt 4-36.....	Touring....	1500	5	25.6	115	34x4	34x4
Franklin G Runab.....	Runabout...	1650	2	18.3	100	32x3	32x4
G.J.G. Junior.....	P'd'r Tour..	1250	5	22.5	104	32x3	32x3
Great Southern 30.....	Roadster...	1400	2	25.6	113	34x4	34x4
Great Southern 30.....	P'd'r Tour..	1500	5	25.6	113	34x4	34x4
Great Western 40.....	Touring....	1600	5	28.9	114	34x3	34x3
Great Western 40.....	Semi-torp..	1650	5	28.9	114	34x3	34x3
Great Western 40.....	Roadster...	1600	2	28.9	114	34x3	34x3
Great Western 40.....	Torpedo....	1750	5	28.9	114	34x3	34x3
Great Western 40.....	Det'a'h. P'd'r	1750	5	28.9	114	35x4	35x4
Henry W.....	Touring....	.....	5	25.6	115	34x4	34x4
Henry W.....	Roadster...	.....	2	25.6	115	34x4	34x4
Henry C.....	Touring....	.....	5	27.2	116	34x4	34x4
Henry C.....	T. Tonneau..	.....	4	27.2	116	34x4	34x4
Henry C.....	Roadster...	.....	2	27.2	116	34x4	34x4
Henry C.....	Speedster...	.....	2	27.2	116	34x4	34x4
Herreshoff 25.....	Coupe.....	1400	2	18.3	100	32x3	32x3
Hudson Roadster.....	Roadster...	1600	2	25.6	114	34x4	34x4
Hudson Roadster.....	Mile-a-min..	1600	2	25.6	114	32x4	32x4
Hudson Touring.....	Touring....	1060	5	25.6	114	34x4	34x4
Hudson Touring.....	Torpedo....	1600	4	25.6	114	34x4	34x4
Hudson Touring.....	Roadster...	1600	2	25.6	114	34x4	34x4
Illinois 1912.....	Baby Tonn..	1750	4	28.9	120	36x3	37x4
Illinois 1912.....	Semi-torp..	1750	5	28.9	120	36x3	37x4
Imperial 33-32.....	Torp. Road..	1250	2	28.9	114	34x3	34x3
Imperial 33-32.....	Semi-torp..	1250	2	28.9	114	34x3	34x3
Imperial 34.....	Semi-torp..	1400	5	29.3	116	34x4	34x4
Imperial 44.....	Semi-torp..	1750	5	32.4	120	36x4	36x4
Inter-State 30-A.....	Roadster...	1700	2	32.4	118	34x4	34x4
Inter-State 30-A.....	P'd'r Tour..	1750	5	32.4	118	34x4	34x4
Jackson 42.....	Touring....	1500	5	32.4	118	34x4	34x4
Johnson A.....	Racer.....	1500	2	28.9	112	34x3	34x3

1, Paterson 48; Abbott-Detroit 44; 3, Marion 48; 4, Kline 4-30; 5, Great Western; 6, Lion; 7, King; 8, Overland 9, Jackson 42

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Johnson A.....	Touring....	\$1600	5	28.9	112	34x3 1/2	34x3 1/2
Johnson A.....	F'd'r Run....	1650	3	28.9	112	34x3 1/2	34x3 1/2
Johnson A.....	F'd'r Tour....	1650	5	28.9	112	34x3 1/2	34x3 1/2
King 35.....	Roadster....	1565	2	23.2	115	34x4	34x4
King 35.....	Touring....	1565	5	23.2	115	34x4	34x4
Kisselkar 30.....	F'd'r Racer..	1500	2	28.9	116	34x4	34x4
Kisselkar 30.....	F'd'r Tour....	1500	2	28.9	116	34x4	34x4
Klinekar 4-30.....	Touring....	1750	5	25.6	118	34x4	34x4
Klinekar 4-30.....	T. Tonneau..	1750	4	25.6	118	34x4	34x4
Klinekar 4-30.....	Roadster....	1750	2	25.6	118	34x4	34x4
Lambert 66-B.....	Det'a'h. Ton.	1400	4	27.3	107	32x3 1/2	32x3 1/2
Lambert 66-B.....	Touring....	1500	5	27.3	112	32x3 1/2	32x3 1/2
Lambert 99-C.....	Roadster....	1650	2	27.3	112	35x4	35x4
Lambert 99-B.....	Torpedo....	1700	4	27.3	115	35x4	35x4
Lambert 99-A.....	Touring....	1700	5	32.4	115	34x4	34x4
Lexington DF.....	Roadster....	1775	2	27.3	117	34x4	34x4
Lexington DF.....	Touring....	1775	5	27.3	117	34x4	34x4
Lion 40.....	Roadster....	1550	2	32.4	116	36x4	36x4
Lion 40.....	Touring....	1600	5	32.4	116	36x4	36x4
Marathon M-40.....	Touring....	1500	5	28.9	118	34x4	34x4
Marathon M-40.....	Roadster....	1400	4	28.9	118	34x4	34x4
Marathon M-40.....	Torp. Tour..	1600	5	28.9	120	34x4	34x4
Marion 35.....	F'd'r Tour....	1285	5	25.6	111	32x4	32x4
Marion 35.....	Roadster....	1285	2	25.6	111	34x4	34x4
Marion 37.....	Touring....	1285	5	25.6	111	34x4	34x4
Marion 46.....	Roadster....	1750	2	27.3	120	36x4	36x4
Marion 47.....	Touring....	1750	4	27.3	120	36x4	36x4
Marion 48.....	Touring....	1750	5	27.3	120	36x4	36x4
Maxwell Special..	F'd'r Tour....	1480	5	28.9	114	34x4	34x4
Mitchell 5-4.....	Touring....	1350	5	28.9	112	34x4	34x4
Mitchell 5-6 & 2-6	Touring....	1750	5	33.8	125	36x4	36x4
Mitchell 5-6 & 2-6	Roadster....	1750	2	33.8	125	36x4	36x4
Moline 35-Touring	Touring....	1700	5	25.6	114	37x4	37x4
Moline 35-Road..	Roadster....	1700	2	25.6	114	36x3 1/2	36x3 1/2
Moline 35 Road..	Roadster....	1600	4	25.6	114	36x3 1/2	36x3 1/2
Moon 30.....	Touring....	1600	5	32.4	115	34x4	34x4
Moon 30.....	Torpedo....	1600	4	32.4	115	34x4	34x4
Moon 30.....	Roadster....	1600	2	32.4	115	34x4	34x4
Moon 30.....	Raceabout..	1650	2	32.4	115	34x4	34x4
New Parry 35.....	Touring....	1450	5	28.9	116	32x—	34x—
New Parry 35.....	Roadster....	1350	2	28.9	116	32x—	34x—
New Parry 35.....	Phaeton....	1400	4	28.9	116	32x—	34x—
Oakland 40.....	Touring....	1450	5	27.3	112	34x4	34x4
Oakland 40.....	Roadster....	1450	3	27.3	112	34x4	34x4
Only.....	Touring....	1250	4	28.9	112	31x4	31x4 1/2
Overland 59.....	Coupe.....	1250	3	25.6	106	32x3 1/2	32x3 1/2
Overland 61.....	F'd'r Tour....	1500	5	30.6	118	34x4	34x4
Overland 61.....	Torp. Tour..	1500	4	30.6	118	34x4	34x4
Patterson 35.....	Touring....	1250	5	25.6	108	32x3 1/2	32x3 1/2
Paige Beverly.....	Coupe.....	1600	4	22.5	104	32x3 1/2	32x3 1/2
Pathfinder 40.....	Touring....	1750	5	27.3	118	34x—	34x—
Pathfinder 40.....	Phaeton....	1750	2	27.3	118	34x—	34x—
Pathfinder 40.....	Phaeton....	1750	4	27.3	118	34x—	34x—
Penn T-R.....	Runabout..	1350	2	27.3	115	34x3 1/2	34x3 1/2
Penn T-5.....	Touring....	1400	5	27.3	115	34x3 1/2	34x3 1/2
Petrel 45.....	T. Tonneau..	1500	4	30.6	115	34x3 1/2	34x3 1/2
Petrel 55.....	Touring....	1500	5	30.6	115	34x3 1/2	34x3 1/2
Petrel 65.....	F'd'r T. Ton.	1600	4	30.6	115	34x3 1/2	34x3 1/2
Petrel 75.....	F'd'r Tour..	1600	5	30.6	115	34x3 1/2	34x3 1/2
Pilot 40.....	Touring....	1650	5	32.4	120	36x4	36x4
Pilot 40.....	Roadster....	1650	2	32.4	120	36x4	36x4
Pilot 40.....	Speedster..	1650	2	32.4	120	36x4	36x4
Pullman 4-30.....	F'd'r Tour..	1675	5	26.4	118	34x4	34x4
Pullman 4-30.....	T. Tonneau..	1675	4	26.4	118	34x4	34x4
Rambler Cr. Coun.	Touring....	1650	5	32.4	120	36x4	36x4
Rambler Cr. Coun.	Torpedo....	1650	4	32.4	120	36x4	36x4
Rambler Cr. Coun.	Roadster....	1600	2	32.4	120	36x4	36x4
Reading 40.....	Roadster....	1650	2	40.0	122	36x4 1/2	36x4 1/2
Reading 40.....	Touring....	1725	5	40.0	122	36x4 1/2	36x4 1/2
Reading 40.....	F'd'r Tour..	1750	5	40.0	122	36x4 1/2	36x4 1/2
Regal N.....	Coupe.....	1250	3	22.5	100	32x3 1/2	32x3 1/2
Regal H.....	Touring....	1400	5	28.9	118	34x4	34x4
Richmond M.....	Runabout..	1250	2	32.4	112	34x4	34x4
Richmond M.....	Touring....	1400	5	32.4	112	34x4	34x4
Schacht G-F.....	Touring....	1585	5	29.6	120	34x4	34x4
Schacht G-F.....	F'd'r Tour..	1585	5	29.6	120	34x4	34x4
Shelby 40.....	Torpedo....	1275	2	27.4	120	36x3 1/2	36x3 1/2
Shelby 40.....	Roadster....	1275	4	27.4	120	36x3 1/2	36x3 1/2
Shelby 40.....	Torp. Tour..	1275	5	27.4	120	36x3 1/2	36x3 1/2
Spaulding C-P.....	F'd'r Tour..	1550	5	25.6	112	32x3 1/2	32x3 1/2
Spaulding C-P.....	Touring....	1500	5	25.6	112	32x3 1/2	32x3 1/2
Spaulding C-P.....	T. Tonneau..	1500	4	25.6	112	32x3 1/2	32x3 1/2
Spaulding C-P.....	Roadster....	1450	2	25.6	112	32x3 1/2	32x3 1/2



1, Maxwell Special; 2, Warren-Detroit; 3, Cutting T-35; 4, De Tamble; 5, E-M-F; 6, Reo the Fifth; 7, Overland; 8, Flanders



1, Maxwell Mercury; 2, Selden; 3, Lion 40-L; 4, Knox; 5, Hudson; 6, Ohio 40; 7, Krit; 8, Marion 33; 9, Rambler

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Spaulding E.....	Touring.....	\$1600	5	27.3	117	34x	34x
Spaulding E.....	T. Tonneau.....	1600	4	27.3	117	34x	34x
Spaulding E.....	Touring.....	1600	5	27.3	117	34x	34x
Staver 35-B.....	F'd'r T. Ton.....	1650	4	30.6	112	34x4	34x4
Staver 35-B.....	F'd'r Tour.....	1650	5	30.6	112	34x4	34x4
Staver 35-B.....	Roadster.....	1650	2	30.6	112	34x4	34x4
Staver 35-B.....	Rac. Road.....	1750	2	30.6	112	34x4	34x4
Stod.-Day. Savoy.....	Touring.....	1450	5	25.6	112	33x4	33x4
Stod.-Day. Savoy.....	Roadster.....	1450	4	25.6	112	33x4	33x4
Stod.-Day. Savoy.....	Roadster.....	1350	2	25.6	112	33x4	33x4
Stod.-Day. Stratf.....	Semi-Torp.....	1750	2	27.3	114	36x4	36x4

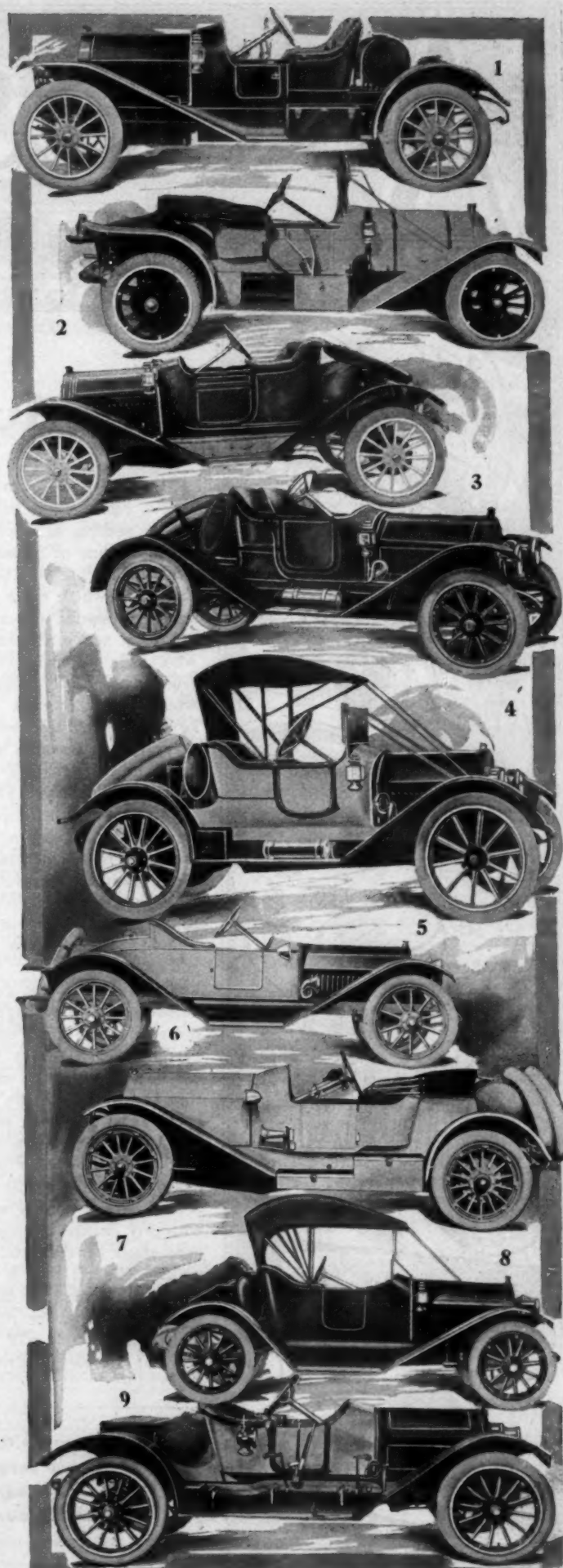
## \$1000 Class—Including

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Alpena 30.....	F'd'r Road.....	\$1100	2	25.6	112	44x3	34x3
Alpena 30.....	Touring.....	1175	5	25.6	112	33x3	34x3
Alpena 30.....	F'd'r Tour.....	1200	5	25.6	112	34x3	34x3
Alpena 30.....	Det'ch. Ton.....	1200	2 or 4	25.6	112	34x3	34x3
Anna.....	Democrat.....	950	2	22.0	100	34x3	34x3
Auburn 30-L.....	F'd'r Tour.....	1100	5	25.6	112	34x3	34x3
Auburn 30-L.....	F'd'r Road.....	1100	5	25.6	112	34x3	34x3
Brush 1912.....	Lib. Runab.....	350	2	6.4	80	28x3	28x3
Brush 1912.....	St. Runab.....	450	2	6.4	80	28x3	28x3
Buick 34.....	Roadster.....	900	2	22.5	91	32x3	32x3
Buick 35.....	F'd'r Tour.....	1060	4	22.5	102	32x3	32x3
Buick 28 and 29.....	Roadster.....	1075	2	25.6	108	34x3	34x3
Cameron 28.....	F'd'r Road.....	1000	2	24.0	104	32x3	32x3
Cartercar H.....	Touring.....	1200	4	25.6	102	32x3	32x3
Clark T.....	Torp. Road.....	1100	2	26.4	114	34x3	34x3
Courier.....	Roadster.....	1150	2	22.5	108	32x3	32x3
Courier.....	Touring.....	.....	5	22.5	108	32x3	32x3
Crow-Elkhart 50.....	F'd'r Road.....	875	3	22.5	110	32x3	32x3
Crow-Elkhart 52.....	Touring.....	1100	5	25.6	113	32x3	32x3
Crow-Elkhart 52.....	Roadster.....	1200	2	25.6	113	32x3	32x3
Cutting A-30.....	Torp. Road.....	1200	2	25.6	116	34x4	34x4
Cutting A-30.....	Torp. Tour.....	1250	5	25.6	116	34x4	34x4
Dalton 6.....	Runabout.....	900	2	20.3	106	32x3	32x3
Day Utility B.....	F'd'r Conv.....	1150	5	25.6	110	32x3	32x3
De Tamble K-L-M.....	Torp. Road.....	1075	2	28.9	116	34x4	34x4
Dispatch E.....	Torp. Road.....	700	2	.....	96	36x3	36x3
Dispatch E.....	Rumble.....	725	3	.....	96	36x3	36x3
Dispatch G.....	Torp. Road.....	850	2	.....	120	36x3	36x3
Dispatch G.....	Surrey.....	850	4	.....	120	36x3	36x3
Dispatch G.....	F'd'r Tour.....	900	5	.....	120	36x3	36x3
Dispatch G.....	Coupe.....	1000	2	.....	120	36x3	36x3
Duryea Electa.....	Runabout.....	750	2	.....	80	34x1	40x1
Duryea Buggy Ty.....	Buggyaut.....	600	2	.....	84	38x1	42x1
Duryea Runabout.....	Runabout.....	700	2	.....	100	30x3	36x3
Elmore R-25.....	Roadster.....	1150	2	.....	108	32x3	32x3
Elmore R-25.....	Touring.....	1200	4	.....	108	32x3	32x3
E-M-F, A-1912.....	Roadster.....	1100	2	25.6	112	32x3	32x3
E-M-F, A-1912.....	Demi-Tonn.....	1100	4	25.6	112	32x3	32x3
E-M-F, A-1912.....	F'd'r Tour.....	1100	5	25.6	112	32x3	32x3
Flanders S.....	Roadster.....	750	2	20.3	102	30x3	30x3
Flanders S.....	Suburban.....	800	4	20.3	102	30x3	30x3
Flanders S.....	Coupe.....	1050	2	20.3	102	30x3	30x3
Flanders S.....	Touring.....	800	4	20.3	102	32x3	32x3
Ford T.....	Roadster.....	590	3	22.5	100	30x3	30x3
Ford T.....	Touring.....	690	5	22.5	100	30x3	30x3
Ford T.....	Town Car.....	900	6	22.5	100	30x3	30x3
G.J.G. Junior.....	Raceabout.....	1000	2	22.5	104	32x3	32x3
G.J.G. Junior.....	Runabout.....	1125	2	22.5	104	32x3	32x3
G.J.G. Junior.....	F'd'r Runa.....	1175	2	22.5	104	32x3	32x3
Halladay 30.....	Roadster.....	1100	2	22.5	114	32x3	32x3
Halladay 30.....	Touring.....	1100	5	22.5	114	32x3	32x3
Herreshoff 25.....	Runabout.....	950	3	18.3	100	32x3	32x3
Herreshoff 25.....	Roadster.....	950	2	18.3	100	32x3	32x3
Herreshoff 25 Tou.....	Touring.....	1150	4	18.3	110	32x3	32x3
Hupmobile Runa.....	Runabout.....	750	2	16.9	86	30x3	30x3
Hupmobile Runa.....	Torpedo.....	850	2	16.9	86	30x3	30x3
Hupmobile Runa.....	Coupe.....	1100	3	16.9	86	30x3	30x3
Hupmobile Tour.....	Roadster.....	850	2	16.9	110	30x3	31x3
Hupmobile Tour.....	Touring.....	900	5	16.9	110	30x3	31x3
Hupmobile 32.....	Tor. Tour.....	900	5	16.9	106	30x3	30x3
Jackson 26 and 28.....	Torp. Road.....	1100	2	25.6	110	32x3	32x3
Jackson 32.....	Touring.....	1100	5	25.6	110	32x3	32x3
Johnson A.....	Spec. Road.....	1200	2	28.9	112	34x3	34x3

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Warren 12-30	F'd'r Semi-t	\$1250	4	25.6	110	34x3	34x3
Warren 12-30	Fore-door	1300	5	25.6	110	34x3	34x3
Warren 12-35	Roadster	1415	2	27.3	112	34x3	34x3
Warren 12-35	Touring	1500	5	27.3	112	34x3	34x3
Warren 12-40	Touring	1700	5	28.9	116	34x4	34x4
Wilcox 35	Touring	1500	5	28.9	115	—x3	—x3
Wilcox 36	T. Tonneau	1500	4	28.9	115	—x3	—x3
Wilcox 37	Roadster	1500	3	28.9	115	—x3	—x3
Wilcox 38	Fore-door	1600	5	28.9	115	—x3	—x3
Zim'rman Z-40-R	Roadster	1485	2	33.0	116	34x3	34x3
Zim'rman Z-40-F	F'd'r Tour.	1600	2	33.0	116	34x3	34x3

## Cars Costing Up to \$1249

Name and Model	Body	Price	Seats	H.P. S.A.E.	Wheels	Tires Front	Tires Rear
Jonz B	Roadster	\$750	3	.....	104	32x3	32x3
Jonz B	Roadster	750	4	.....	104	32x2	32x3
Jonz B air-cooled	Roadster	750	2	.....	104	32x3	32x3
Jonz B air-cooled	Roadster	750	4	.....	104	32x3	32x3
Kenmore D	Runabout	700	2	18.3	100	30x3	30x3
Kenmore D	Roadster	725	3	18.3	100	30x3	30x3
Kenmore D	Tourabout	750	4	18.3	100	30x3	30x3
Kenmore D	Touring	775	5	18.3	100	30x3	30x3
Kenmore D	Fore-door	800	5	18.3	100	30x3	30x3
Krit A	Runabout	800	2	22.5	96	32x3	32x3
Krit K	Touring	900	5	22.5	106	32x3	32x3
Marathon K-20	F'd'r Road.	685	2	16.9	90	34x3	34x3
Marathon K-20	F'd'r Tour.	850	5	16.9	96	34x3	34x3
Marathon L-30	F'd'r Road.	1000	2	25.3	116	34x3	34x3
Marathon L-30	F'd'r Road.	1200	5	25.3	116	34x3	34x3
Maxwell Mes'g'r.	Runabout	600	2	16.2	86	28x3	28x3
Maxwell Mascotte	Roadster	950	2	25.6	104	32x3	32x3
Maxwell Mascotte	Touring	980	5	25.6	104	32x3	32x3
Maxwell Mercury	Roadster	1150	2	28.9	110	34x4	34x4
McIntyre F-12	F'd'r Tour.	1125	5	25.6	114	34x3	34x3
Metz 22	Runabout	495	2	22.5	90	30x3	30x3
Mitchell 2-4	Roadster	950	2	22.5	100	32x3	32x3
Mitchell 4-4	Touring	1150	4	22.5	115	32x3	32x3
Mitchell 4-4	Touring	1150	4	22.5	115	32x3	32x3
Motorette R	Runabout	385	2	.....	74	28x3	29x3
Oakland 30	Roadster	1200	2	25.6	106	34x3	34x3
Oakland 30	Touring	1200	5	25.6	106	34x3	34x3
Only	Runabout	1000	2	28.9	112	31x4	31x4
Overland 58	Runabout	850	2	22.5	96	32x3	32x3
Overland 58	Torp. Road.	900	2	25.6	116	32x3	32x3
Overland 58	F'd'r Tour.	900	5	25.6	116	32x3	32x3
Overland 60	F'd'r Tour.	1200	5	27.3	114	34x4	34x4
Overland 60	Torp. Tour.	1200	4	27.3	114	34x4	34x4
Paige Beverly	Bev. Tour.	975	5	22.5	104	32x3	32x3
Paige Beverly	Kenil. Road.	975	3	22.5	104	32x3	32x3
Paige Beverly	Pineh't Sur.	900	4	22.5	104	32x3	32x3
Paige Beverly	Rock. Runa.	925	2	22.5	104	32x3	32x3
Penn RF & T-4	Torp. Road.	1000	2	22.5	105	32x3	32x3
Penn RF & T-4	F'd'r Tour.	1100	4	22.5	105	32x3	32x3
Petrel 25	Roadster	850	2	22.5	98	32x3	32x3
Petrel 35	Touring	1000	4	22.5	98	32x3	33x3
Pickard	Runabout	800	2	25.6	104	32x3	32x3
Pickard	Roadster	875	3	25.6	104	32x3	32x3
Pickard	Surrey	950	4	25.6	104	32x3	32x3
Pickard	Touring	950	4	25.6	104	32x3	32x3
Pickard	Touring	975	5	25.6	104	32x3	32x3
R.C.H. Runabout	Runabout	700	2	16.9	86	30x3	30x3
R.C.H. Runabout	Runabout	750	4	16.9	86	30x3	30x3
R.C.H. Touring	Touring	850	5	16.9	110	31x3	31x3
Regal N	Runabout	900	2	22.5	100	32x3	32x3
Regal L	Touring	1000	5	27.3	109	32x3	32x3
Regal L	F'd'r Tour.	1050	5	27.3	109	32x3	32x3
Regal L	Torp. Tour.	1050	4	27.3	109	32x3	32x3
Reo Fifth	Runabout	1000	2	25.6	112	34x3	34x3
Reo Fifth	Touring	1055	5	25.6	112	34x3	34x3
Reo Fifth	Detach. To.	1055	4	25.6	112	34x3	34x3
Richmond N	Runabout	950	2	32.4	106	32x3	32x3
Richmond N	Touring	1050	5	25.6	106	32x3	32x3
Ritter 1912	Torp. Runa.	685	2	16.9	90	30x3	30x3
Roadster 20	Runabout	650	2	15.6	105	—x3	—x3
Roadster 20	F'd'r Tour.	700	4	15.6	105	—x3	—x3
Rogers C	Runabout	700	2	18.0	90	36x1	36x1
Rogers C	Surrey	750	4	18.0	90	36x1	36x1
Schacht S	Runabout	825	2	21.0	103	32x3	32x3
Schacht B	Runabout	850	2	21.0	103	32x3	32x3
Schacht B-T	Touring	900	5	21.0	103	32x3	32x3
Union 3	Runabout	650	2	20.3	103	30x3	30x6
Warren 12-30	Roadster	1175	2	25.6	110	34x3	34x3



1, Stoddard-Knight; 2, Imperial 33; 3, Cole 30; 4, National; 5, Pope-Hartford; 6, Elmore; 7, Velie Special; 8, Cartercar; 9, Marquette

# Accessibility



## Reduces Cost of Repairs

**P**ROGRESS in the art of automobile construction has been indicated in nothing so much as in the advances along the line of accessibility. This qualification of what may be called a good machine is nowhere more important than in a vehicle designed to carry those who are not only not professional machinists, but who, as a general rule, are far removed from such. The locomotive engineer who would grumble most unceasingly should he be compelled to climb beneath the engine every time it becomes necessary to make a small adjustment has still less cause to complain than the average automobilist who starts out to enjoy a pleasant ride through the country or city, as it may be. It should not be necessary for him to soil the sleeves of his clothing when making an adjustment, such, for instance, as tightening a grease cup, or any of the many little processes which are a feature of automobiling.

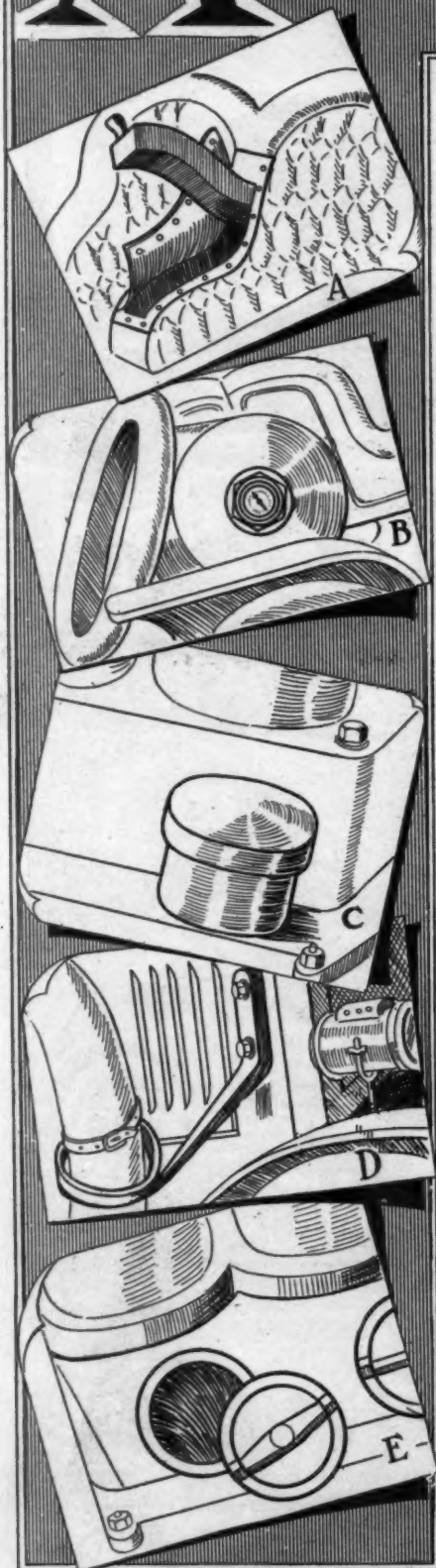
Accessibility is not alone confined to the adjustments which have to be made along the road. There are many features which present themselves in this line while the car is being tuned up in a garage preparatory to a trip upon the road. The oil reservoir must, as a rule, be filled before starting. Why should the oil-filler hole be so small that the owner of the car is compelled to go on a still hunt for a funnel before he can put the oil in the reservoir with any chance of getting at least a fair percentage of the total quantity into the tank? The oil that is wasted is not the only bad feature in this case. The unsightly engine, after it has been smeared with cylinder oil, will bring pain to the heart of the careful driver.

Oil which is spilled over the engine will smoke when the engine becomes warm. Besides, there is also the detail that its odor is most disagreeable. The clearing which must necessarily follow brings us to another point in accessibility. The engine is dirty and must be wiped off. As a general rule this is an operation that will bring joy to the heart of the laundryman if ordinary clothes are worn, for in reaching down towards the lower part of the crankcase, where the dirt will generally collect, the sleeve will be soiled in nine times out of ten.

Grease and oil are known to be about the finest dust collectors extant, and they do not hesitate to fulfill this office when they are deposited on a motor. The dirt thus accumulated is very apt to work into the engine and cause the ruin of any bearings with which it comes in contact. It is much harder to clean an engine upon which dirt has once started to take hold than a motor which is well kept in this respect. Oil will cause the dirt to get a grip on the machine which will be hard to shake off, especially if the motor is so arranged that it is hard to reach down into the lower parts.

If the owner of a car has never been used to anything else he will probably resign himself to the conditions philosophically under the opinion that while certain features of motoring are rather disagreeable, the sport as a whole is worth while. Some day, however, he will be called upon to make an adjustment in some other car, and then the surprise will come and another recruit will be added to the ever-growing ranks of those who are clamoring for this feature in cars.

The points where increased accessibility



A—Pocket between the front seats on the Stoddard-Dayton Special

B—Gasoline gauge on the tank of the Stoddard-Dayton Saybrook

C—Handy oil-filler accessibly placed on the Chalmers 36 motor

D—Tire bracket fixed at side of radiator of the Abbott-Detroit 44

E—Hand-hole in the basechamber of the Jackson 52

# It Means Money



## Saves Time and Energy

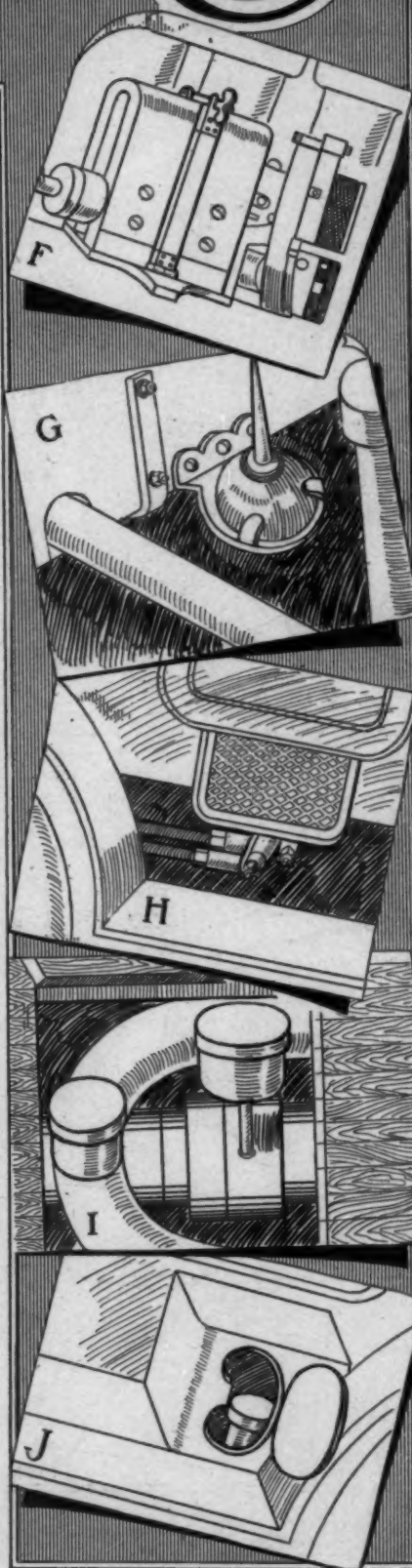
may readily be secured by additional forethought are not few in number; neither are they confined to a single part of the motor or chassis. There are many cars which are fitted with easy brake adjustment devices, yet those in which this adjustment entails much more work and time than would be necessary with the use of care in the design are numerous indeed. These little features of accessibility do not, as a rule, cost the builders additional money, or, if they do, in very few cases is the added cost large enough to make any appreciable difference in the total cost of outfit per machine. Take, for instance, the case of a grease cup located in some spot that is not very accessible. In most cases the cup is fitted, and while there is a rather vague regret that the part cannot readily be inspected nor got at without considerable trouble on the part of the operator, still it is not thought of after the part has once been fitted in place and attention given to the more noteworthy details of construction. How much more would it have cost that builder to run a copper tube to the part and fit the cup at the end of it in a spot where it would have been a matter of seconds to give it a turn or two or to remove it and fill it, instead of being an operation requiring many minutes and much discomfort?

The garage owner of modern days has ceased to be the haphazard workman that he was in the early days of the industry, but the progress of the last decade has wrought a wonderful change in this respect. No longer are repairs made and a rough estimate struck in which the apparent prosperity of the customer and the needs of the garage owner form the basis of the calcu-

lation. A system has been installed where the time of each repair is carefully taken and the cost of the material used. These two points are the factors in determining the amount of the bill in all well-kept garages, and it is up to the car owner to insist upon this method.

A typical form used in one of the largest repair shops in New York City is reproduced on page 72 to show how these calculations are made and how systematized the work has become in this line. The blank is shown somewhat reduced in size. At the top are entered the order number and other details relating to the subsequent filing of the blank. Below in the body of the form are the details of the cost of the job, the two principal divisions being the material required and the amount of labor put into the work. The charges made to the customer are generally 75 cents an hour for labor. The labor costs the repair shop from 42 to 50 cents per hour, and the balance is made up in overhead charges and the margin of profit.

It does not require a stretch of the imagination to perceive the fact that it will take the workman a much longer time to perform an operation upon an inaccessible spot than it will upon a car where all the mechanism is exposed to the view of the operator without the necessity for the removal of several parts before he reaches the point at which he can begin his actual work. Many of the repair jobs will naturally necessitate removal of cover plates, perhaps, or even of certain sections of the motor. Perhaps the radiator will have to be removed in order to make a certain adjustment, while on another car the same may be easily effected without making this



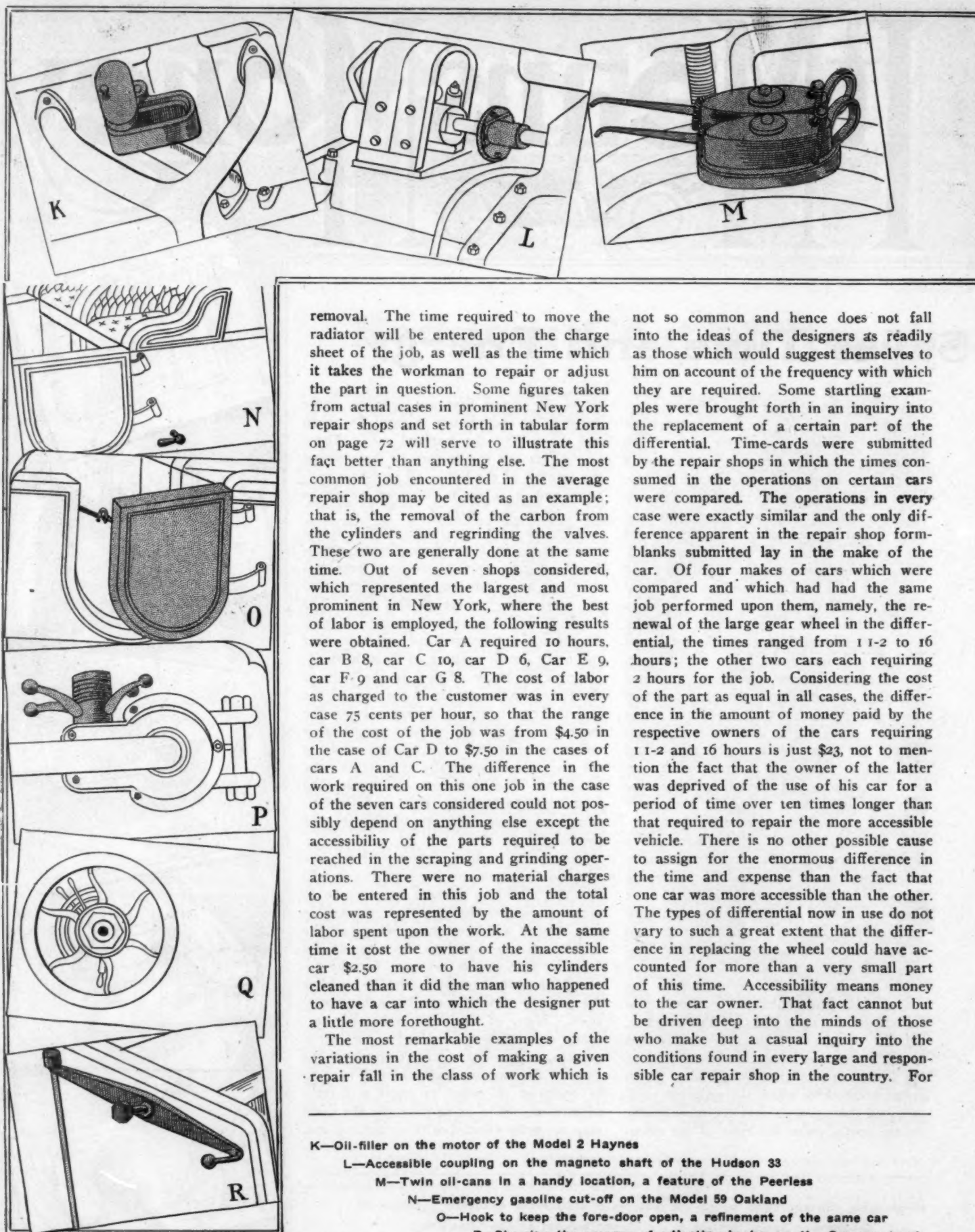
F—Magneto clip and strap which are features of Oldsmobile Autocrat

G—Showing handy location of the oil-can bracket on the KisselKar

H—Easily-got-at brake adjustment a feature of the KisselKar

I—Universal joint grease cups under floor-boards of the Everitt 30

J—Handhole to reach grease-cup on the Oakland 45



removal. The time required to move the radiator will be entered upon the charge sheet of the job, as well as the time which it takes the workman to repair or adjust the part in question. Some figures taken from actual cases in prominent New York repair shops and set forth in tabular form on page 72 will serve to illustrate this fact better than anything else. The most common job encountered in the average repair shop may be cited as an example; that is, the removal of the carbon from the cylinders and regrinding the valves. These two are generally done at the same time. Out of seven shops considered, which represented the largest and most prominent in New York, where the best of labor is employed, the following results were obtained. Car A required 10 hours, car B 8, car C 10, car D 6, Car E 9, car F 9 and car G 8. The cost of labor as charged to the customer was in every case 75 cents per hour, so that the range of the cost of the job was from \$4.50 in the case of Car D to \$7.50 in the cases of cars A and C. The difference in the work required on this one job in the case of the seven cars considered could not possibly depend on anything else except the accessibility of the parts required to be reached in the scraping and grinding operations. There were no material charges to be entered in this job and the total cost was represented by the amount of labor spent upon the work. At the same time it cost the owner of the inaccessible car \$2.50 more to have his cylinders cleaned than it did the man who happened to have a car into which the designer put a little more forethought.

The most remarkable examples of the variations in the cost of making a given repair fall in the class of work which is

not so common and hence does not fall into the ideas of the designers as readily as those which would suggest themselves to him on account of the frequency with which they are required. Some startling examples were brought forth in an inquiry into the replacement of a certain part of the differential. Time-cards were submitted by the repair shops in which the times consumed in the operations on certain cars were compared. The operations in every case were exactly similar and the only difference apparent in the repair shop form-blanks submitted lay in the make of the car. Of four makes of cars which were compared and which had had the same job performed upon them, namely, the renewal of the large gear wheel in the differential, the times ranged from 11-2 to 16 hours; the other two cars each requiring 2 hours for the job. Considering the cost of the part as equal in all cases, the difference in the amount of money paid by the respective owners of the cars requiring 11-2 and 16 hours is just \$23, not to mention the fact that the owner of the latter was deprived of the use of his car for a period of time over ten times longer than that required to repair the more accessible vehicle. There is no other possible cause to assign for the enormous difference in the time and expense than the fact that one car was more accessible than the other. The types of differential now in use do not vary to such a great extent that the difference in replacing the wheel could have accounted for more than a very small part of this time. Accessibility means money to the car owner. That fact cannot but be driven deep into the minds of those who make but a casual inquiry into the conditions found in every large and responsible car repair shop in the country. For

K—Oil-filler on the motor of the Model 2 Haynes

L—Accessible coupling on the magneto shaft of the Hudson 33

M—Twin oil-cans in a handy location, a feature of the Peerless

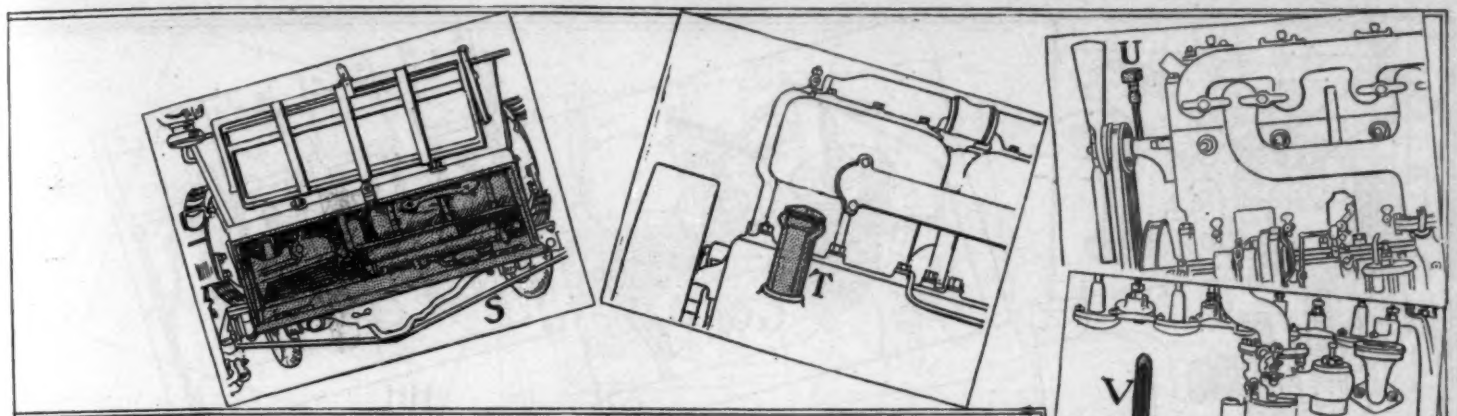
N—Emergency gasoline cut-off on the Model 59 Oakland

O—Hook to keep the fore-door open, a refinement of the same car

P—Showing the manner of adjusting brakes on the Commer truck

Q—Horn button on wheel of Stoddard-Dayton Special

R—Crank to open oil petcocks in Peerless 48 crankcase



instance, a standard price cannot be set for the renewal of the piston rings on all makes of cars any more than it could be upon two staple articles of entirely different nature and value. The operation of piston-ring renewal may be taken for another example of wide variation in cost, as well as showing a feature which exists in many repair jobs where the parts are contained well within the inner portions of the motor. Considering the difference in time and also that feature which appeals to the car user so strongly, namely, the dollar-and-cents part of the proposition, the comparisons made on six cars show the following times: 4 hours, 3 hours, 1 day, 20 hours, 2 1-2 days and 3 days. If these figures do not awaken at least a vague sense of wonderment on the part of the average car owner, the difference in the bills will. The material cost in this case does not amount to much. Piston rings cost in the neighborhood of 90 cents apiece; there are three of these generally on each piston, which would bring the average cost for a four-cylinder motor, for the rings alone, to about \$10.80; for the time on the 4-hour job, \$3; for the time on the 3-day job, \$20.25—the difference in this case being a matter of a little over \$17.

The work of fitting on the rings requires such a short time that it is hardly to be considered in the total. What the owner of the car paid for was the taking down and reassembling of the car and the retuning to which it had to be submitted after this had been done. It often happens, even in cases where standardization is made an aim, that the piston rings will have to be fitted by filing and other means and then finished off with emery. This will consume a portion of the total time; nevertheless, the largest proportion will be devoted to

the assembling of the motor and all the subsequent adjustments.

These experiences proved that in the majority of cases the greatest part of the time taken in making a repair is that used in taking down and reassembling the parts. The simple replacement of a worn part does not require any undue length of time except where a small amount of scraping or other comparatively simple operations have to be done in order to secure a better fit. Hence, if the time in making the repair is used as a basis in determining the amount of the bill, it is evident that the greater accessibility of parts will go a long way toward reducing such bills to a minimum.

Accessibility as a good feature is not limited to the parts of the mechanism of the car itself, although perhaps the question here develops more importance than at any other point. The placing of the tools on a car is a point which should receive more than ordinary attention, as it is a feature which has much to do with the comfort of those who are passengers in the automobile and at the same time is of great influence on the appearance of the car itself. Beneath the rear seat in a touring car will generally be found the jack and several other tools which are of distinctly roadside utility. On a wet, slippery day it is not pleasant to have to request the passengers to step out while the jack and pump are fished out to repair a blowout which had happened just at that inopportune moment. This point has been taken up by some manufacturers who have designed a very neat tool-box which fits on the rear of the car just forward of the trunk rack. This box is made large enough to contain all the tools that will ever be required for roadside repairs and has the

S—Tool-box arrangement on the rear of Pope-Hartford cars

T—Oil-filler hole on the crankcase of Regal cars

U—Showing the convenient grease-cup on the Knox fan shaft

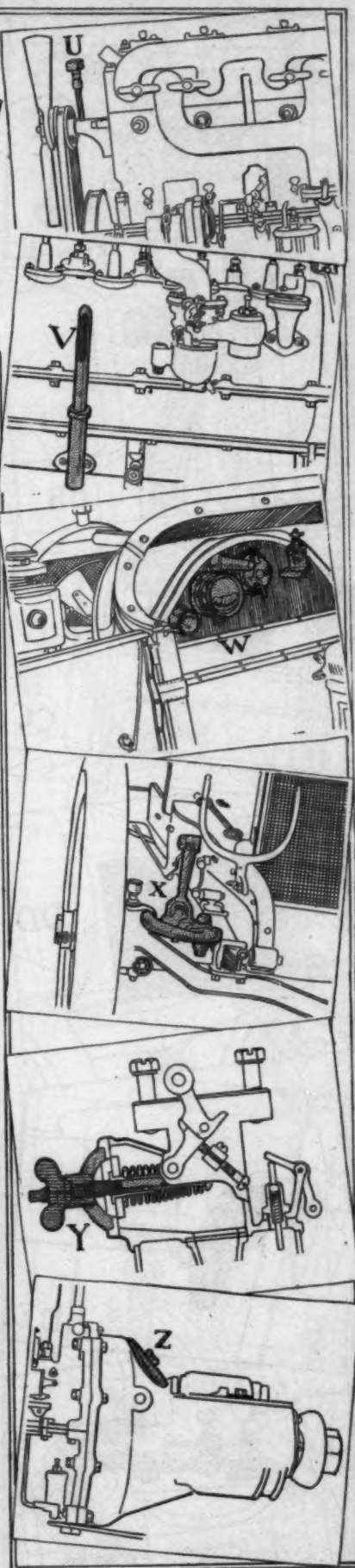
V—Oil level gauge in plain view on the Ohio

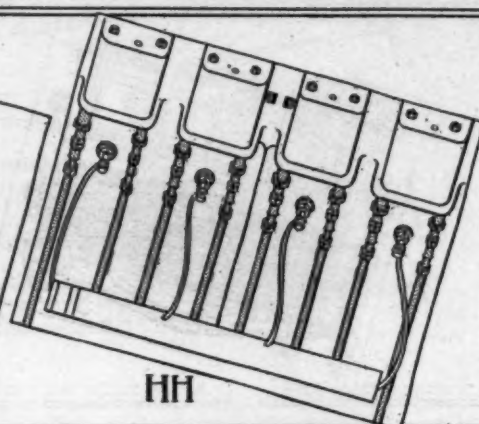
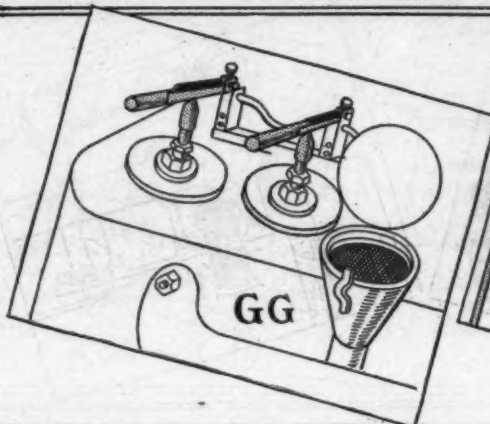
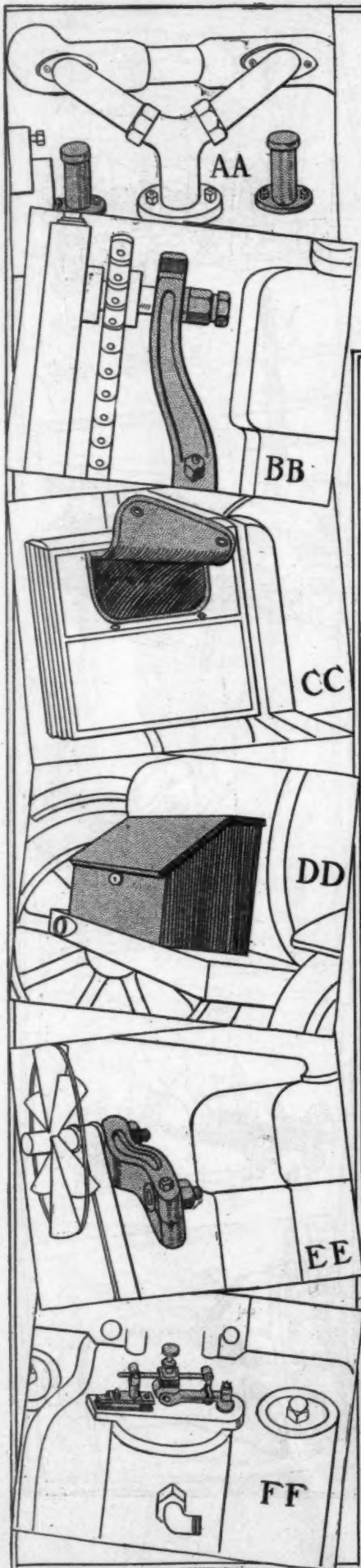
W—Dash arrangement on the Speedwell Model H-S

X—Front axle and steering gear on the Palmer-Singer

Y—Wing nut for carburetor adjustment on the E-M-F

Z—Handhole in the clutch housing on the Midland





convenience of being readily accessible without disturbing any of the occupants of the car. In this position the light from the tail lights serves to illuminate the tool-box and the desired tool may be readily found at night. This is a feature which means much to the safety of the car, as may be readily realized when it is considered that in the cases where it is necessary to lift the rear seat to disclose the tool-box the Stygian darkness must be illuminated before it is possible to find the tool desired. This can only be done in most cases by the aid of a match, and matches spell danger when used in such positions.

A little point of accessibility used in many of this year's fore-door models is a small hook so arranged as to be near the hand, by means of which the door can be held ajar for a slight distance. The door is equipped with a screw eye into which the hook fits and holds the door in such a position that the draught created by the moving car will be caught up by the door, thus quickly ventilating the forward compartment. There is no denying the fact that the forward compartment of a fore-door car is warm on hot summer days, and this simple device serves to thoroughly ventilate the car.

The attachment of magnetos to the engine frame has engaged the attention of makers for some time, and there is a marked tendency on the part of most dealers at the present time to use a metal strap which passes over the magneto. This strap is hinged at the lowest point on one side and when it is desired to remove the magneto the clasp, which is held by a wing nut, is loosened and the strap bent back. The magneto may then be readily taken out after the coupling which attaches it to the shaft is disengaged. By

this means the magneto is very accessible, as this arrangement can readily be built comparatively high. When the hood is opened the operator has the magneto at hand.

The time necessary to remove and replace magnetos on several cars was taken as a means of ascertaining the merits of the systems now in general use of attaching the magneto to the motor. A workman was called in and asked to remove the instrument from its seating while he was timed. He worked at the speed of the average operator and was found to have accomplished his work well within a half-hour in all cases except one, where it is only fair to state that the car in question was an out-of-date model of a company which now has a very efficient means of connection. Magneto retiming on four cars was then tried, and it was found that the times required were 15 minutes in one case and a half-hour in all three of the others.

The placing of other accessories should be as high on the side of the motor as possible in order that they are all within easy reach. It is very unpleasant to reach down through a labyrinth of greasy metal projections into the lower part of the aperture exposed by the raising of the hood, and for this reason it is always appreciated when such things as valve adjustments can be effected without soiling the clothing. Carburetor adjustments can also be more readily made when this instrument is placed as high as possible. There are difficulties which enter into the question here, however, as in many cases the gasoline flows from the tank to the carburetor by the force of gravitation alone. If the carburetor is lifted too high there will not be a good flow and in some cases there

AA—Showing the oil-fillers on the Marquette cars

BB—Method of making the fan adjustments on the Cadillac

CC—Illustrating the pocket on the fore-door of the Marquette

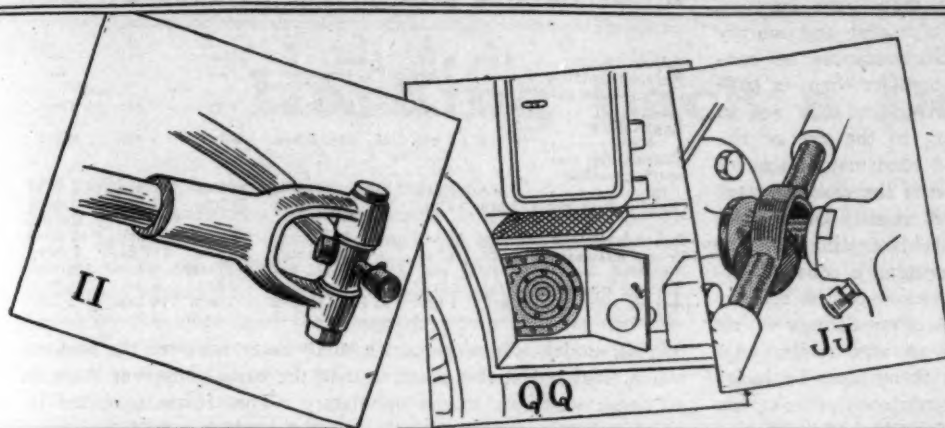
DD—Tool-box on the rear of the Paige-Detroit

EE—Showing the fan belt adjustment on the Flanders 20

FF—Air adjustment of carburetor of the Amplex

GG—The Packard oil-filler and ignition testers

HH—High points of valve adjustment on the Cunningham



will be no flow at all. Where the carbureter is carried as high as possible on the side of the motor the flow of gasoline will often be seriously impeded when a hill of more than ordinary steepness is encountered. If traveling at a high rate of speed the sudden tilt given to the machine when it first strikes the hill will often disturb the flow, even if the hill be only of small inclination. When the hill is steep, however, there will generally have to be some means of accelerating the flow by the introduction of an increased pressure to the tank. This pressure is introduced by means of a hand-pump which is placed within reach of the driver. It must be remembered that on the raceabout types of cars where high speeds are often maintained for a considerable length of time, additional oil is also necessary occasionally and a pump is installed for this purpose in the same manner as the pump for the additional gasoline tank pressure.

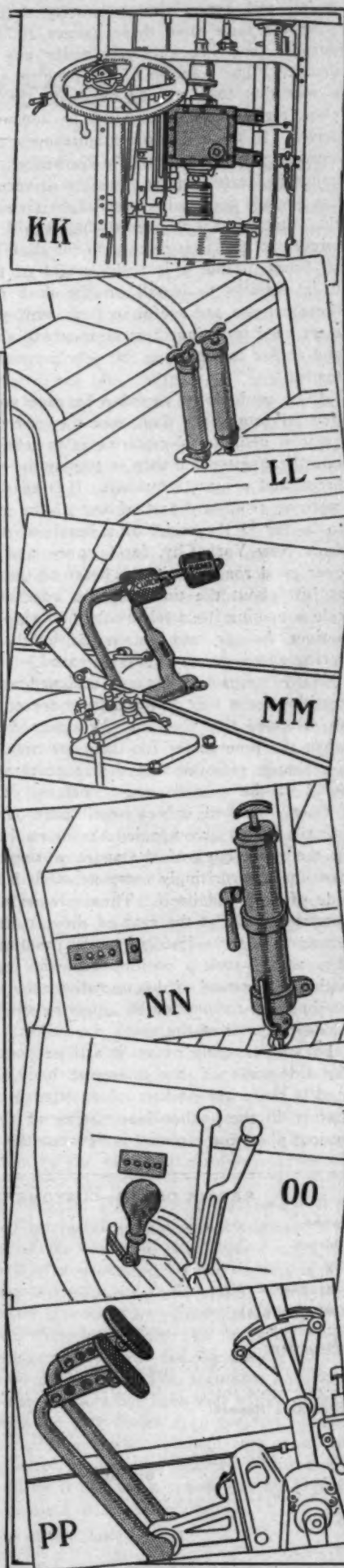
These two pumps should be placed in such a position that the eyes of the driver need not be removed from the road ahead of the machine and at the same time should be very handy. An ideal spot which has been selected by manufacturers of this type of automobile is located just alongside the driver's seat within easy reach of the hand. It is important that the pump be convenient, for dangerous results may be the consequence if the driver's attention is distracted while he searches for the pump.

While having the gasoline-flow problem in mind it is well to mention a detail which has been rather neatly taken care of by manufacturers. A small valve has been fitted to shut off the gasoline flow at the point at which it leaves the tank. This valve, instead of being controlled by a

handle which can only be reached by a rather inconvenient stretching of the arm or an exceptionally dirty climb beneath the chassis frame, is so located that the handle projects through the side member of the chassis frame on the left side of the car. It is thus out of the way of the control levers, but at the same time if a leak is discovered it is easily within reach of either the driver or any other occupant of the car.

Fan belt adjustments are not often necessary, but when they do have to be made the car is just as apt to be upon the road many miles from the nearest garage as in the center of the automobile row of some large city. In the former case it is up to the operator of the car to make the adjustment himself, while in the latter case it is of course optional. The steaming radiator cap is generally the first indication of this trouble unless it be the pounding sound given forth by the fan as it strikes the radiator on account of the faulty alignment occasioned by the bracket having been twisted from its usual position. The nut by means of which the proper adjustment is made should be at the top-most point of the spindle so that it can be readily turned by the wrench from the side of the engine.

A feature of accessibility which is as often overlooked by the builder as it is by the purchaser of an automobile is the arrangement of dash accessories. A cluttered-up dash presents an appearance which is not what may be called neat in any way. There are numerous gauges for the oil level and gauges for the gasoline level, and the oil pressure and numerous other indicators and other arrangements which are placed so closely together as to be confusing. As a cause of this they are not used



II—Grease cup on steering connecting-rod of Cadillac 30

JJ—Clutch withdrawal mechanism on the Overland

KK—Removable gearset cover on the Speedwell

LL—Oil and gasoline pumps on the Mercer Model 30 R

MM—Adjustable pedals on the Winton Six

NN—Gasoline pressure pump and cut-out on Stearns Knight

OO—Horn bulb and electric switches on the E-M-F

PP—Adjustable pedals used on the Premier cars

QQ—Method of reaching the chain on the Simplex

at all and hence almost entirely defeat their own purpose.

At the same time these gauges fulfill a useful and worthy purpose, and hence cannot under any circumstances be condemned. The solution of the problem is to place them in such a way that they will be handy to the driver and still not so close together that they will be confusing to the eye of the driver. In these days of enlightenment and road maps, distances between points are generally known, so that if the gasoline level gauge is located on the tank the driver will readily know if he has enough to last him until he arrives at his destination. On the other hand it is argued that it will serve as a constant reminder to him if it is kept on the dash where it can be seen at all times. Thus it is with several of the other fittings which it is possible to install on the dash of an automobile. All these articles are useful in their way, yet there must be judgment used in fitting them or they will get into each other's way and go far in hindering the very purpose for which they are intended.

The methods of carrying baggage are receiving more attention of late years than was the case formerly. One of the greatest delights of motoring is to take a trip for the day out into the country and then to stop at the side of some cool, shady brook and prepare a luncheon. It is possible to start early in the morning from any part of any of the great cities and by noon to be far in the midst of a beautiful country. One may start from New York City, for instance, and after a delightful spin, over good roads, be in the heart of the Berkshires or Catskills at just about the time that the appetite given by the bracing ride is making itself felt by the motoring party. When this time arrives the car may be stopped by the side of the brook or spring and a dainty repast prepared.

Many compact baskets so designed as to include all the necessities for a trip of this nature are on the market. They are so arranged that they may be strapped to the automobile, and when the time comes for their use they are ready. The straps are simply removed and the contents are ready for use. Instead of the miscellaneous collection of pots and pans which formerly formed only a small part of the array of culinary utensils which accompanied an automobile luncheon expedition in the early days of the sport, a simple, compact box which contains a surprisingly complete outfit is all that is carried outside of the food itself. These provision trunks are carried in the trunk rack at the rear of the car, or in some cases are so arranged as to be fastened to the running board. In either case they are in such a position that the contents may be readily withdrawn instead of this operation requiring an extended length of time, not to mention an annoying search through various inaccessible parts of the car.

For the carrying of small articles pockets are often fitted in the side-walls of the limousine body, and in the fore-door models there are pockets often fitted in the doors themselves; that is, in the leather inner lining of the door. A very convenient place for a pocket is between the two front seats of the

#### ACTUAL TIMES OF REPAIRS MADE ON DIFFERENT CARS

	A	B	C	D	E	F	G
Adjust clutch.....	3 hrs.	1/4 hr.	5 min.	1 hr.	—	—	—
Reface clutch.....	—	4 hrs.	1 1/2 hrs.	—	—	—	—
Carbon from cylinders .....	10 hrs.	8 hrs.	10 hrs.	6 hrs.	9 hrs.	9 hrs.	8 hrs.
Regrounding valves .....	10 hrs.	8 hrs.	10 hrs.	6 hrs.	9 hrs.	9 hrs.	8 hrs.
Connecting rod bearings taken up .....	3 hrs.	3 hrs.	1/4 hr.	—	4 hrs.	6 hrs.	2 days
Quiet timing gears .....	3 hrs.	3 hrs.	—	4 hrs.	30 hrs.	13 hrs.	3 days
Fan adjustment.....	1/4 hr.	1/4 hr.	—	10 min.	10 min.	1/4 hr.	10 min.
Renew piston rings .....	4 hrs.	3 hrs.	—	1 day	20 hrs.	2 1/2 days	3 days
Retiming .....	1/4 hr.	—	—	1 1/2 hrs.	4 1/2 hrs.	5 hrs.	4 1/2 hrs.
Adjust brakes.....	1 hr.	1 hr.	1 hr.	1 hr.	2 hrs.	1/2 hr.	1 hr.
Adjust diff'l.....	1/2 hr.	1 hr.	1 to 10	1 1/2 hrs.	2 hrs.	16 hrs.	2 hrs.

touring models. In some cars a small cover fits over the pockets which is placed at this point, and to the casual observer there is no break whatever in the upholstery. This forms a pocket in which it is very safe to keep little articles which would otherwise be left about in the car and which are often of sufficient value to overcome the scruples of the street gamins who ordinarily limit their importunities to a mere harmless, if annoying, operation of the horn. Other pockets are often fitted according to the individual ideas of the purchaser of the car, but it is on the whole an idea that can be followed up to advantage by the body builder who studies the convenience and comfort of the motorist and designs the little details which go so far in adding to the great pleasure of touring.

WHEN HAVING THE CAR OVERHAULED—In order that the life of the car be extended through as long a period of usefulness as possible it should be overhauled about once a year. In this time, if a car has been well handled, the depreciation will not have been great. There will, however, be certain parts that need replacement and a general tuning up of the whole machine may be very profitably undertaken. The total amount of wear which will occur each year in parts of the motor or power transmission subjected to friction will necessitate the replacement of different parts of the mechanism and in order that the added cost of operation be not greater at the end of the season than the expenditure necessary for the new parts these replacements should be made. The reboring of the cylinders will be found to result in cutting down the cost of operation of an old car. This is the case because the inefficiency of a motor in which the compression has failed to a great degree is remarkable. The extra cost for fuel and the impossibility of attaining any power from the motor would alone pay for the reboring. It is sometimes the case that a renewal of the piston rings will be sufficient if the walls of the cylinders have not been scored owing to the fact that the lubrication of the motor has been neglected. One great precaution that must be observed in overhauling the car is that when the valves are reground and emery powder is used as the grinding material none be allowed to fall within the cylinder, as this is disastrous to the surface and will ruin it.

REPAIR ORDER—CUSTOMERS				Order No.....Type.....Chassis No.....			
Owner .....				Date Received.....			
Address .....				Repairs Authorized by.....			
City .....				Date Finished.....Date Delivered.....Fol.....			
Guarantee Expires .....							
Work Done at.....							
Instruction:							
Foreman's Report							
Signature							

Parts				Labor			Customer
Cost	Guarantee	Charge	Hours	Cost	Guarantee	Charge	Charge
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
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.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....

Type of blank used in Lozier garage to check cost of material used and time consumed in making repairs

## Harking Back a Decade

FROM *The Motor Review*, January 2, 1902:

Non-realization of expectations as far as the sale of lighter-powered vehicles is concerned has led to a flood of rumors as to the financial soundness of the De Dion Bouton Motorette Company, of Brooklyn. These reports are categorically denied by the officials of the company, who state that the difficulties of the present are due to a faulty contract with the parent company in France rather than to lack of capital.

The Stearns Steam Carriage Company, of Syracuse, N. Y., has announced a general raise in catalogue prices for its entire line. The increases range from \$100 to \$200 per car.

Among the recently incorporated manufacturing concerns are the Des Moines Automobile Company, which will build a patented car to sell at \$800, and the Niagara Motor Vehicle Company, which proposes to build a 700-pound car with a possible speed of 45 miles an hour.

The Crude Rubber Company, of New York, has been attached by the Hempstead Bank of Hempstead, L. I., for a debt of \$5,000. The litigation arose over a note for \$5,000 made by George Watkinson & Company, of Philadelphia, which was indorsed by the rubber concern. Afterward payment of the note was stopped by its makers and the bank took action against not only the makers, but the indorsers as well. Charles R. Flint, founder of the rubber company, is said to be the butt of attack.

A. L. Riker, Vice-President Byllesby, Chief Engineer Whiting and Chief Constructor Sammis, of the Riker Motor Vehicle Company, have resigned. They objected to the removal of the factory to Hartford last summer, but were overruled.

Exports of automobiles and parts from the port of New York last week totaled only \$9,750.

The Philadelphia automobile trade has decided against holding a local show this season. The dealers have decided to use the money to advertise their cars throughout the selling season.

According to the tendencies displayed at the recent Paris Salon, the two-cylinder motor is giving way either to the single-cylinder type or four-cylinder engines.

It seems probable now that, in spite of the alluring bait of heavy sales through foolishly liberal guarantees, the matter will be settled, so far as the manufacturers are concerned, by the adoption on the part of the N. A. A. M. of a standard form of guarantee covering the delivery of the vehicle to the purchaser in proper working condition and with the workmanship and material warranted as first class.—Editorial.

## The Spirit of the Year

(Continued from page 9.)

in which the driver is enclosed in a separate compartment. The one-compartment body has more followers. It is a cross between a limousine and a coupé, and generally has but one door for the front and rear seat, with one of the front seats hinged for entrance and exit and without a partition between the front and rear seats. This is an admirable design for the man who drives his own car and who wants to enjoy the company of his family and friends when out. In the medium-priced field there has been particular activity in the colonial coupé line. Many of these have been made for show purposes, but there does not seem to be a strong demand for them in the buying field. They are attractive designs, but many buyers imagine that they will not continue long in the popular eye.

It would be wrong to end this cursory review of the trend of the times without a word on car equipment. As already stated,

the self-starter is today looked upon more or less as a matter of equipment rather than one of integral design. This will soon change. The use of electric lights has progressed with leaps and bounds. In the early part of last year many concerns new in the field of electric lighting experienced difficulties. Keeping the battery charged was the big problem. On six-cylinder cars it was not difficult, but it became a real problem on four-cylinder types, due to the different speeds at which the magneto generators were driven from the engine. The trouble lay in the fact that cars frequently stood for hours along the curb with the lights burning and the motor idle. With other makers the troubles experienced were those of satisfactory mounting on the motor of the power generators. Some had the generators too big for use on many power plants. But the pushers of this form of lighting have been specially active. They have solved most of their problems and big advances may be looked for.

Demountable rims are now standard with many makes of cars. A year ago these were optional. This is a big advancement, as it makes for country touring. The car owner now feels that he can start off with his family on a tour of several days without the horror of tire troubles. Everything that facilitates the operation of the car by the owner should be encouraged.

Leaving the car and glancing at the more general aspects of the year just closed, the critic cannot but be struck with the legal activities of the year. It has been one of patent litigation and turmoil. The ball was set rolling with the overthrow of the Selden patent situation early in January. This seemed to set a pace for the other patent holders, and ever since there has been a constant flow of new suits filed and temporary findings in old cases. This crop of litigation seems to have been due to the fact that many patent owners have gotten on their feet in a business way and are in a position to defend their rights against infringers. There has been also a great deal of patent bartering. Many have changed hands. The termination of the Association of Licensed Automobile Manufacturers had a little result on the situation, as some makers who had shop rights of patents through their membership in this organization forfeited those rights when it passed out of existence.

One commendable movement of the year has been the development of the maintenance department. Many builders of pleasure cars have erected big maintenance departments for both their pleasure and commercial cars in the larger cities. These new departments have proven big sellers of cars, as they have created a spirit of confidence in the companies. It is a big thing with a buyer as to what attention he is going to receive from the maker after he has purchased his car. Many a buyer has sold his car and refused to buy others of the same make solely because of the treatment given him by the dealer.

This dealer treatment suggests a trend that was hinted at a year ago, namely, the wider installation of branch houses and the gradual elimination of the dealer in the larger centers of population. There has been a pronounced trend in this direction. In the larger cities it has shown itself most. While this has been taking place other concerns have discontinued branches and turned the business over to dealers. In many of these transitions financial arrangements which are not known on the surface have often played a big part. The argument advanced against the agency in some quarters has been that where dealers change from year to year the new dealer does not feel obliged to give special care to the buyers who obtained cars from his predecessor. This has acted against the maker. With many concerns, however, the dealer is as fixed a quantity as the branch would be, and is as permanent as could be desired.

# Longstroke Motors

## A Leading Tendency



**R**EALIZATION of the advantages of the long-stroke motor has been slow on the part of the American engineers who, as a rule, are quick to seize upon an improvement in the elemental designs of machinery. It is true that the advantages to be reaped from its use have been for a long time problematical, still at the same time, on the part of the majority, there have not been any extraordinary efforts to solve these problems, or to reduce them to a point where the advantages and disadvantages would be obvious.

Of late years there has been a great tendency, however, toward a more rigid examination of the features of the long-stroke motor, and that examination has in several noteworthy cases resulted in the building of a motor embracing an increased stroke-bore ratio. Elasticity has been pointed out as one of the salient points of consideration in the design of a motor, and when it was conceded that the long-stroke motor had this qualification to a marked degree the attention which it had already attracted was greatly augmented. It has also been pointed out with great emphasis that the reserve power which could be called into use for hill-climbing and other purposes where heavy-duty work on the part of the motor would be required, alone would suffice to justify the construction of a motor of this type. This virtue, too, may be claimed for the long-stroke motor, as it has been proved that in the case of two motors with equal bore that having the longer stroke proved the better hill-climber of the two, other features of the design being the same.

It is natural to expect that a concern will ponder for some time the advisability of making any radical changes in the designs which have been standard with that concern for some time. Any change in the important details of a motor would necessitate an enormous expenditure in the direction of factory equipment and tools. It is also a well-recognized fact that to produce a long-stroke motor it is necessary to do more than merely lengthen the stroke of the motor which is a part of the regular product. Entirely new and complicated problems enter into the design of the car which is fitted with a long-stroke motor. One of these points may be readily perceived when a diagram such as is shown in Fig. 1 is constructed.

If the stroke of the motor be 5 inches the connecting-rod readily clears the bottom of the cylinder, while if the stroke be 6 inches it is readily seen that the connecting-rod will have to be lengthened to decrease the angularity so that it will readily clear the bottom of the cylinder; hence it is necessary to increase the height of the engine to a great extent when the stroke is increased.

When the height of the motor is increased the center of gravity is raised, and this in turn raises the center of gravity of the entire car. The factor of safety from turning over is thus decreased to a large extent, and this has to be overcome in some manner by the construction of the chassis. Builders meet the added height of the engine by the method of supporting the engine, that is by lowering it in the frame. The carbureter may be carried at the same height above the base of the motor as in the short-stroke variety.

The cooling problem of the motor is not altered in any way by the added length of the stroke so far as any practical purposes are concerned. It is true that for each stroke the heated gases are longer in contact with the cooling walls of the cylinder, but this added length of time is small and the total additional loss of heat by this means makes little difference in the thermal efficiency of the motor.

The life of the motor according to authorities varies, not so much with distance covered by the piston in its total travel as with the number of revolutions made by the crankshaft. This at first sight would appear to be strange, since it may generally be considered that the number of revolutions made by the crankshaft would be exactly proportional to the distance covered by the piston; however, if two machines be compared which have engines of different length of stroke, it is evident that the engine with the longer stroke will make a smaller number of revolutions for a given piston speed. It is evident that at the end of each stroke the reciprocating parts of the engine must be rapidly brought to rest and started in the other direction. This rapid change of the direction of motion entails a shock to the parts for which the wear is directly responsible. Therefore, it is evident that for a given distance there will be about the same number of shocks to the machine having the smaller stroke as to that having the longer stroke, and hence the same mileage may be expected.

This matter of decreased number of shocks owing to the smaller number of revolutions required for a given piston speed is of greater importance in the matter of engine vibration, as the reciprocating parts of the motor will be heavier to a certain extent in the motor having the longer crank throw, and hence the problems of balancing will be altered to a certain extent. The final balance of the motor, however, should not be affected by the change in the elementary design necessitated by the increase in the stroke-bore ratio. The vibrations due to the inertia of the reciprocating masses should be reduced to some extent, independently of the balancing problem *per se*, by a careful distribution of weights.

On account of the increase in the height of the motor and the consequent rise in the center of gravity, it may well be expected that the overhead or valve-in-the-head type of cyl-

### GASOLINE ENGINE TEST BY NATIONAL MOTOR VEHICLE COMPANY

No. of Engine, 8504.

Size of engine, 4 $\frac{7}{8}$ " bore x 6" stroke. 4-cylinder.

R.P.M.	Watts.	Efficiency of Dynamometer.	H.P.
700	25200	.873	38.60
800	28770	.854	45.10
900	32660	.837	52.30
1000	35000	.816	57.40
1100	40020	.815	65.85
1200	42160	.805	70.10
1300	44800	.799	75.20
1400	49320	.799	82.70
1500	52800	.797	88.65
1600	57000	.834	91.75
1700	58000	.82	94.75
1800	57000	.802	95.30
1900	60000	.788	102.00
2000	62000	.775	107.00

inder will not be a feature in this type of motor. The increased length of the cylinder will give more room for the placing of parts and accessories on the cylinder walls than will the short-stroke type of motor. For this reason, as well as for the necessity of making extra efforts to keep the height of the motor as low as possible, it will no doubt be general practice in the long-stroke construction to place poppet valves on the side of the motor. Sleeve-valve motors are particularly adapted to the long-stroke principal, as the valve areas are not so restricted as in the case of the poppet-valve type. Another point in favor of the use of the long-stroke with the sleeve valve is the fact that it is possible to concentrate the weight of the heavier parts of the valve actuating mechanism at the lower parts of the motor, and hence counteract to a great extent the tendency to produce a motor having a high center of gravity.

The American manufacturer has started with lengthy strides to overtake his foreign competitors in the field of endeavor typified by the long-stroke motor, and his first step has been to drop the idea first obtained by a merely casual interest that the long-stroke motor is only a short or square-stroke motor to which has been added an inch or so of stroke without changing the bore. Intricate details arise which are of an entirely separate nature from any which are encountered in motors of small stroke-bore ratio. Increased cost of manufacture has been argued as a point against the adoption of the long-stroke motor, but it is in itself a point which the manufacturer cannot advance as being the entire cause of its omission from his line. Increased weight for a given horsepower rating is a point which cannot be urged consistently against the new type of motor, as the increase, if any, is small since the increase in stroke means an increase in horsepower, which offsets the increased weight.

The lubrication problem has not been satisfactorily relegated to the list of advantages or of disadvantages of either type. There is no doubt that in the early days of the long-stroke, low-speed motor the oiling question was relatively simple, but according to modern practice the increased stroke would entail an increased piston speed when the matter is viewed from the logical standpoint of a standard required revolutions per minute, and the lubricating problem has not as yet been threshed out. In any cylinder lubricating system it must be remembered that the greatest amount of oil should be applied to the hottest part of the cylinder. It should likewise be a matter of important consideration that the oil is distributed equally about the piston, for if this is not the case there will be unequal wear on different parts of the piston rings. This is the case with short-stroke motors as well as the long-stroke type, but in the latter case the difficulties attending the introduction and equal distribution of the oil are augmented. The piston not only covers a greater amount of space in its stroke, but is itself longer theoretically on account of the greater bearing surface required to take the greater side-thrust due to the increased angularity of the longer connecting-rod. This side-thrust determines the amount of friction of the piston rings, and hence fixes the most important factor in the oiling problem. It is not very likely that extraordinary difficulties will be met in the lubrication of motors up to as high as 7-inch stroke, in spite of the high piston speeds attained by these motors. A positive force feed will no doubt be found to give results which will be more uniform and satisfactory than the other methods of lubrication in this case.

Dynamometer tests on two motors made by the Moline Auto Co. will be of interest in making comparisons as to the performances of two motors of similar bore, 4 inches, one having a stroke of 4.1-2 inches and the other having a stroke of 6 inches. These tests have been worked out and plotted in graphical form, so that the results are presented in a manner which will facilitate comparison of the respective performances of the two motors. The first set of curves, shown in Fig. 2, gives a comparison of the amount of gasoline consumed per brake-horsepower hour by the two motors. The full line shows the

consumption curve for the motor with the 6-inch stroke, while the dash line shows the curve of the other motor. It will be noted that at low engine speeds the advantage is with the short-stroke motor, while at higher engine speeds the long-stroke motor consumes a much less amount of fuel than the short-stroke type. The two curves cross each other at about 8.2 horsepower, which will correspond on the average car to a speed of about 12 miles an hour, roughly speaking. In average touring the speed maintained averages in excess of this amount, and hence the total fuel consumption would be less when the long-stroke motor was used. According to these figures there would not be much advantage in using a long-stroke motor for such purposes as taxicabs, where the average speed maintained about the crowded parts of the metropolitan districts is not much above 8 or 9 miles an hour, in spite of the occasional period where the cab is used in the out-of-town districts or along the wider and less employed thoroughfares.

Dynamometer tests on two National motors gave the results which are tabulated elsewhere on these pages. A difference of 1-8 inch in the bore prevents a satisfactory comparison between the two engines. It will be noted, however, that the motor having the 7.1-2-inch stroke attained the maximum horsepower at 1500 revolutions, while that having the 6-inch stroke was tested up to 2000 revolutions and perhaps would have attained a higher horsepower if the tests could have been continued, since the curve would indicate that the rise in horsepower would have continued for at least a further increase in the number of revolutions per minute.

Besides the factor of fuel consumption at low speeds, there is another point which enters the problem that would indicate that in spite of the fact that the short-stroke motor uses less fuel at the lower speeds than the long-stroke motor, the carburetion obtained by the long-stroke type will be superior as pointed out, on account of the higher velocity of the gases entering the cylinder, owing to the fact that they have a greater volume to fill in the same length of time. This velocity of the entering gases has much to do with the suction produced, and hence with the final quality of the mixture.

A fact which may be mentioned in connection with long-stroke motors is that the requirements for carburetion are more rigid than they are in the short-stroke motors. It is a fact that at the beginning of the automobile industry the long-stroke motor was common. In those days, however, the faulty carbureters and and vaporizers which were in use, as well as the imperfect ignition devices and the impossibility of manufacturing valves above a certain size without the detrimental features of warping entering into the problem, precluded the use of motors running at high piston speeds. As it was necessary to attain a comparatively high number of revolutions per minute in order to have the cars of the day running at a fair rate of speed, the short-stroke motor gradually replaced the other types and gained the ascendancy. Of late, however, since the manufacture of carbureters has been improved to a remarkable extent so that good carburetion is possible over a wide range of engine speeds, and the ignition devices have also been improved so that they are absolutely dependable at all speeds, the long-stroke motor has again been made possible.

#### GASOLINE ENGINE TEST BY NATIONAL MOTOR VEHICLE COMPANY

No. of Engine, 7778.  
Size of Engine, 5" bore 7 1/4" stroke. 4-cylinder.

R.P.M.	Watts.	Efficiency of Dynamometer.	H.P.
900	49350	.871	75.80
1100	56000	.847	88.50
1200	62400	.836	100.00
1300	68800	.833	110.60
1400	77000	.822	125.40
1500	82800	.81	136.85
1600	84150	.85	132.65
1700	80000	.835	128.35

Two magnetos with double distributors.



TABLE SHOWING A COMPARISON OF THE BORE-STROKE RATIOS OF 1912 WITH 1911 CARS

Car.	1912			1911		
	Bore.	Stroke.	Ratio.	Bore.	Stroke.	Ratio.
Lambert 99.....	4 1/4	5 1/2	1.33	.....	.....	.....
Lambert 99-A.....	4 1/4	5	1.11	Same	.....	.....
Lenox.....	4 1/4	5 1/2	1.33	.....	.....	.....
Lexington D-F.....	4 1/4	5 1/2	1.33	4 1/4	5	1.05
Lexington F.....	4 1/4	5	1.11	Same	.....	.....
Lion 40.....	4 1/4	5	1.11	Same	.....	.....
Locomobile L-4.....	4 1/4	4 1/2	1.00	Same	.....	.....
Lozier 46.....	5 1/4	6	1.12	Same	.....	.....
Lozier 51.....	4 1/4	5 1/2	1.19	Same	.....	.....
Marathon K-20.....	3 1/4	3 1/2	1.08	Same	.....	.....
Marathon L-30.....	4	4 1/2	1.12	Same	.....	.....
Marathon M-40.....	4 1/4	4 1/2	1.06	Same	.....	.....
Marathon M-50.....	4 1/4	5 1/2	1.14	.....	.....	.....
Marion 35.....	4	4 1/2	1.13	Same	.....	.....
Marion 36, 37.....	4	5	1.25	.....	.....	.....
Marion 46, 47, 48.....	4 1/4	5 1/2	1.33	4 1/4	4 1/2	1.06
Marmion.....	4 1/4	5	1.11	Same	.....	.....
Marquette.....	5	5	1.00	.....	.....	.....
Marquette 28.....	5	5 1/2	1.10	.....	.....	.....
Mason.....	4 1/4	5	1.11	Same	.....	.....
Maxwell Messenger.....	4 1/4	4	.89	Same	.....	.....
Maxwell Mascotte.....	4	4	1.00	Same	.....	.....
Maxwell Mercury.....	4 1/4	4 1/2	1.00	Same	.....	.....
Maxwell Special.....	4 1/4	5 1/2	1.23	.....	.....	.....
McFarlan 40-45.....	4	5 1/2	1.25	Same	.....	.....
McFarlan 55-60.....	4 1/4	5 1/2	1.17	3 1/4	4	1.10
McIntyre.....	4	5	1.25	.....	.....	.....
Merced 35-R.....	4 1/4	5	1.14	Same	.....	.....
Merced 35-A.....	4 1/2	5	1.11	4 1/4	4 1/2	1.06
Metz 22.....	3 1/4	4	1.16	.....	.....	.....
Midland L-3.....	4 1/4	5	1.11	Same	.....	.....
Midland O.....	4 3/8	5	1.14	4 1/4	5 1/2	1.16
Mitchell 25-2.....	3 1/4	5 1/4	1.46	.....	.....	.....
Mitchell 5-4.....	4 1/4	5	1.18	Same	.....	.....
Mitchell 5-6.....	3 1/4	5 1/2	1.46	.....	.....	.....
Mitchell 7-6.....	4 1/4	5	1.11	.....	.....	.....
Moline 35.....	4	6	1.50	Same	.....	.....
Moon 30.....	4 1/4	4	.89	.....	.....	.....
Moon 40.....	4 1/4	5	1.11	Same	.....	.....
Moon 45.....	4 1/4	5	1.05	Same	.....	.....
Morse D.....	4 1/4	5	1.08	.....	.....	.....
National.....	5	5 11/16	1.13	Same	.....	.....
National.....	4 1/4	6	1.23	.....	.....	.....
New Parry.....	4 1/4	4 1/2	.97	.....	.....	.....
Oakland 30.....	4	4	1.00	Same	.....	.....
Oakland 40.....	4 1/4	4 1/2	1.15	.....	.....	.....
Oakland 45.....	4 1/2	5 1/4	1.16	4 1/4	5	1.11
Ohio Regular.....	4 1/4	4 1/2	1.06	Same	.....	.....
Ohio Speedster.....	4 15/16	4 3/4	.96	.....	.....	.....
Oldsmobile Defender.....	4	6	1.50	.....	.....	.....
Oldsmobile Autocrat.....	5	6	1.20	4 1/4	4 3/4	1.00
Oldsmobile Limited.....	5	6	1.20	Same	.....	.....
Otto.....	4 1/4	4 1/2	1.06	Same	.....	.....
Overland 58.....	3 1/4	4 1/2	1.20	Same	.....	.....
Overland 59.....	4	4 1/2	1.12	Same	.....	.....
Overland 60.....	4 1/4	4 1/2	1.09	.....	.....	.....
Overland 61.....	4 1/4	4 1/2	1.03	4 1/4	4 1/2	1.06
Packard 18.....	4	1 1/16	5 1/2	Same	.....	.....
Packard 30.....	5	6	1.20	.....	.....	.....
Packard 6.....	4 1/4	5 1/2	1.22	.....	.....	.....
Palmer-Singer 6-40.....	4	5	1.25	4	4 1/4	1.18
Palmer-Singer 46.....	4	5	1.25	.....	.....	.....
Palmer-Singer 6-60.....	4 1/4	5 1/2	1.13	Same	.....	.....
Paterson 35.....	4	4	1.00	Same	.....	.....
Paterson 45.....	4 1/4	5 1/4	1.17	.....	.....	.....
Pathfinder 40.....	4 1/4	5 1/2	1.27	Same	.....	.....
Peerless D.....	4	4 1/4	1.15	Same	.....	.....
Peerless J.....	4	5 1/2	1.37	.....	.....	.....
Peerless H.....	5	5 1/2	1.10	.....	.....	.....
Peerless K.....	4 1/4	6	1.33	.....	.....	.....
Peerless L.....	5	7	1.40	.....	.....	.....
Penn R-F, T-4.....	3 1/4	4 1/2	1.20	.....	.....	.....
Penn TR-T5.....	4 1/4	5 1/2	1.33	Same	.....	.....
Petrel 25, 35.....	3 1/4	4 1/2	1.20	.....	.....	.....
Petrel 45.....	4 1/4	4 1/2	1.08	Same	.....	.....
Pierce-Arrow 36-R.....	4	5 1/2	1.28	Same	.....	.....
Pierce-Arrow 48-R.....	4 1/4	5 1/2	1.22	.....	.....	.....
Pierce-Arrow 66-R.....	5	7	1.40	Same	.....	.....
Pilot 40.....	4 1/4	5	1.11	Same	.....	.....
Pope-Hartford 27.....	4 1/4	5 1/2	1.15	Same	.....	.....
Pope-Hartford 28.....	4 3/16	5 1/2	1.28	.....	.....	.....
Pratt 40.....	4 1/4	4 1/2	1.05	Same	.....	.....
Pullman 4-30.....	4 1/16	5	1.23	Same	.....	.....
Pullman 4-40.....	4 1/4	5 1/2	1.22	.....	.....	.....
Rambler Cross Country.....	4 1/4	4 1/2	1.00	.....	.....	.....
Rambler Country Club.....	3 9/16	5	1.10	Same	.....	.....
Rayfield C.....	3 9/16	5	1.54	Same	.....	.....
R. C. H.....	3 1/4	6	1.20	Same	.....	.....
Reading 40.....	5	6	1.20	.....	.....	.....
Regal N.....	3 1/4	4 1/2	1.20	.....	.....	.....
Regal L.....	4 1/4	4	.97	.....	.....	.....
Regal H.....	4 1/4	4 1/2	1.06	Same	.....	.....
Regal R.....	4	4 1/2	1.12	Same	.....	.....
Republic 111, 112, 113.....	4 1/4	5	1.17	.....	.....	.....
Richmond N.....	4	4 1/2	1.12	.....	.....	.....
Richmond M.....	4 1/4	5	1.11	Same	.....	.....
Readster 20.....	3 1/4	4 1/2	1.35	4 1/4	4 1/2	1.00
Selden.....	4 1/4	5	1.05	.....	.....	.....
S. G. V. A.....	3 1/4	4 1/2	1.16	Same	.....	.....
S. G. V. D.....	4	5 1/2	1.30	Same	.....	.....
Simplex 48.....	4 1/4	6 1/2	1.33	Same	.....	.....
Simplex 50.....	5 1/4	5 1/2	1.00	.....	.....	.....
Spaulding C-P.....	4	4	1.00	.....	.....	.....
Spaulding E.....	4 1/4	5 1/2	1.27	.....	.....	.....
Speedwell.....	5	5	1.00	4	4 1/2	1.12
Stafford.....	4 1/4	4 1/2	1.12	Same	.....	.....
Staver 35-B.....	4 1/4	5	1.14	Same	.....	.....
Staver 35-F.....	4 1/4	5	1.11	Same	.....	.....
Stearns-Knight.....	4 1/4	5 1/2	1.29	Same	.....	.....
Stevens-Duryea.....	4 1/4	4 1/2	.95	.....	.....	.....
Stevens-Duryea AA.....	4 1/4	4 1/2	1.12	.....	.....	.....
Stoddard-Dayton Savoy.....	4	4 1/2	1.12	Same	.....	.....
Stoddard-D. Stratford.....	4 1/4	5 1/2	1.14	Same	.....	.....
Stoddard-D. Saybrook.....	4 1/4	5	1.05	.....	.....	.....
Stoddard-D. Special.....	5	5 1/2	1.10	Same	.....	.....
Stoddard-D. Knight.....	4 1/4	5 1/2	1.22	.....	.....	.....
Stuyvesant 48.....	4 1/4	6	1.23	Same	.....	.....
Suburban Limited.....	3 1/4	4 1/2	1.28	Same	.....	.....
Thomas 6-40.....	4 1/4	5 1/2	1.30	.....	.....	.....
Vellie.....	4 1/4	5 1/2	1.17	.....	.....	.....
Warren 12-30.....	4	4 1/2	1.12	.....	.....	.....
Warren 12-35.....	4 1/4	4 1/2	1.09	Same	.....	.....
Warren 12-40.....	4 1/4	4 1/2	1.12	4	4	1.00
Westcott K-L-M.....	4 1/4	5	1.11	.....	.....	.....
Westcott R.....	4 1/4	5	1.05	Same	.....	.....
White GAD.....	3 1/4	5 1/2	1.37	.....	.....	.....
White-GE.....	4 1/4	5 1/2	1.08	.....	.....	.....
Winton 17-C.....	4 1/4	5	1.11	.....	.....	.....

ing to the old equation. This is no more than justice on their part, for, although the rating very nearly approaches the brake tests on the square type of motors, it falls considerably below on the tests made upon the motors of the long-stroke type. It will not be long before a standard formula will be accepted which will call into use the factor of stroke as well as those of bore and number of cylinders.

In summing the matter up it may be said that the balance scale is inclined toward the long-stroke type of motor on account of its greater flexibility, economy and reserve power. The increased cost of manufacture is a point against it and possibly so are the features of a slightly added difficulty in lubricating and a possibility of a decreased thermal efficiency owing to a greater loss of available heat to the cooling water. The last two points, however, are unimportant as the solution of the lubricating problem has been reached by the introduction of a reliable force-feed system, perhaps supplemented with a constant level splash; and the thermal question may be dropped entirely as it is not of sufficient weight to seriously influence the problem. Developments in America during the next few years will be along the lines of the long-stroke type and considerable advantage will be reaped from the fact that the difficulties encountered by the European manufacturers have been already solved by them in one way or another.

The above tables show more vividly than anything else could the trend toward the long-stroke motor. The models which are new this year are shown by a study of the table to be, for the

most part, of what may be called the modified long-stroke type. There are no freak motors with exaggerated stroke such as are seen in Europe, where the tax on motors is governed by the bore, and the stroke is lengthened to an enormous extent to secure the highest possible horsepower at the least possible taxation. This practice, though economical from the builders' standpoint, hardly tends toward the best in engineering.

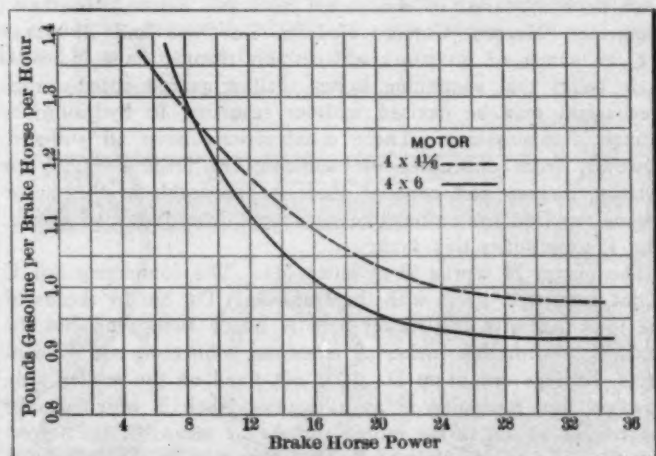


Fig. 2—Curve showing results obtained by the Moline Company on two motors of different ratio

# Digest of the Leading Foreign Papers

## VARIABLE STROKE AND NO CHANGE GEAR—Some time ago P. Ullendorf, whose

address is Hohenzollernstrasse 16, Berlin, drove into that city from Zurich in Switzerland with a car in which there was no gear change mechanism, but the four-cylinder motor of which, on the other hand, was equipped with suitable mechanism for changing the stroke of the pistons. The construction was worked out by Giacomo Rietti, a noted Italian automobile designer, after patent to Giorgio Paduvani, a college professor. Running at 1,400 revolutions per minute and with a stroke of 70 millimeters ( $3\frac{1}{8}$  inches) the motor developed about

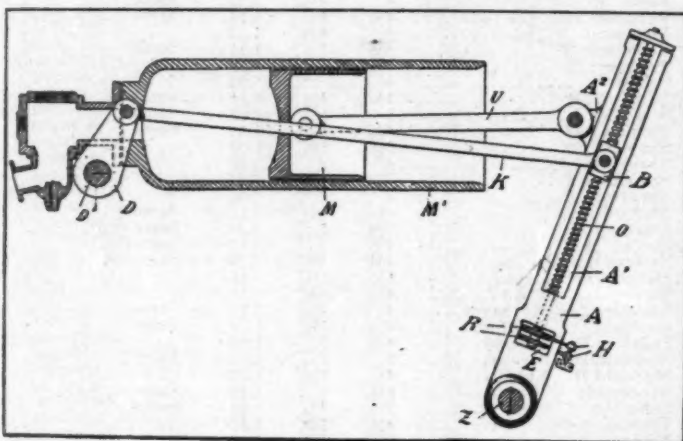


Fig. 1—The Cornu variable stroke design—example of construction that fails to balance

14 horsepower, and with the stroke lengthened to 200 millimeters ( $10\frac{1}{2}$  inches) it produced the same power, minus some friction losses, at 400 revolutions. That is to say, the lengthened stroke takes effect and the revolutions are counted on a crankshaft to which the movements of the piston are transferred by means of the special mechanism described hereafter, and the ratio in which they are transferred varies with the variation of the stroke so as to make the piston speed about the same in both cases.

The effect is thus the same as when the speed of the crankshaft of an ordinary motor is reduced in the gear box.

Since 1904 a number of constructions having the same purpose have appeared in the patent records. Cornu, Montague, Sangester, Merton, Corson, Fudelin, Le Page and Biderman are the names of inventors who in this manner have indicated their belief that something better than a geared speed-change mechanism may be devised without resorting to hydraulic or electric transmissions. These constructions have all suffered, however, from difficulties in balancing the large swinging or rotating masses, and none of them is practicable at the motor speeds required for automobile purposes. The design of Cornu, Fig. 1, exemplifies this fault.

The piston M works in cylinder M1. The connecting-rod U is not connected direct with the crankshaft D1, but by means of the joint A2 with the rocker arm A which swings around the shaft Z. From this rocker A a second connecting-rod K connects with the crankarm D. It is not fixed on the rocker arm, however, but journaled in an adjustable block B which can be moved in and out in the milled slot A1 by means of the screw-bolt O. The nearer B is to Z the larger will be the movement of the rocker arm and the longer the stroke of piston M1.

In the Rietti construction, as actually incorporated in Mr. Ul-

lendorf's car, whose performances in practice have been, if not faultless, at least respectable, the

difficulties in securing a good balancing of the motor have been avoided. Fig. 2 shows the relations of the mechanical elements, as described in the German patent No. 240,375 to Paduvani. The piston K connects with the crankshaft D through a system of changeable leverage. Shafts D, G and O are fixed. Pivot 1 is stationary during operation at any one adjustment of the stroke, but subject to adjustment, around shaft O as a center, for the purpose of changing the stroke. Its position determines the length of the stroke. The connecting-rod H is journaled in the arm A which actuates bellcrank B—the latter mounted on the fixed shaft G—by means of the link C. In the other arm of bellcrank B is journaled the final connecting-rod E by which crankshaft D is rotated. In operation, the arm A turns around point 1 at a fixed pivot, but when the stroke is to be lengthened, it is, as just mentioned, the point 1 whose relation to the bellcrank B is changed by turning it around the permanently fixed shaft O. If, for example, shaft O is turned so that point 1 is moved to 1', then point 2 is moved to 2', 3 to 3'. While the point 3—the end of the primary connecting-rod—in the short-stroke adjustment of point 1 travels only the short distance marked under 3 in Fig. 2 during one revolution of the final crankshaft D, the point 3' travels the much longer distance from d to d' during one revolution of D.

To make plain the travel of each of the levers and rods, the same letters are used to designate corresponding and simultaneous movements of the different parts all through the drawing, Fig. 2. While, for example, the crankarm of shaft D travels from a to b, all the levers travel at the same time the path marked a—b in their respective places in the drawing. This also refers to the piston K. Similarly, when the crankpin of shaft D on its return movement travels from a' to b', all the other points again travel corresponding paths marked a'—b'.

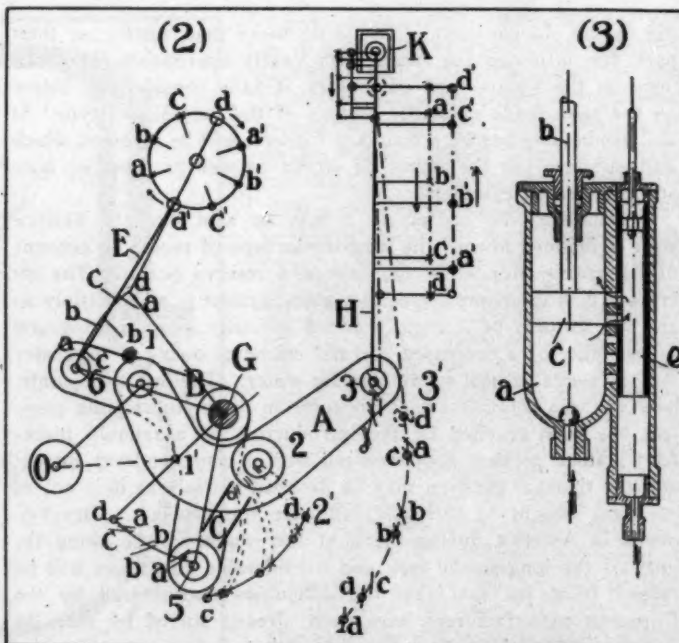


Fig. 2—Diagram of lever-mechanism in Prof. Paduvani's variable stroke motor by which gear changes are eliminated

Fig. 3—Hydraulic adjustment device for changing the stroke of Paduvani motor

And, as may be seen from the graphic comparison of up and down movements of the piston drawn at the side of connecting-rod H, the corresponding paths  $a-b$  and  $a'-b'$ , as well as  $b-c$  and  $b'-c'$ ,  $c-d$  and  $c'-d'$ , are accurately or almost accurately of equal lengths.

Hence, if, in a Rietti motor, two crankpins 180 degrees apart are used for a two-cylinder design, or two crankpins are similarly offset against the two other crankpins in a four-cylinder motor, an almost complete balancing of the moving masses can be effected.

The cylinders in this motor are placed upright on the right-hand side of the mechanism. The adjustment of the stroke is effected hydraulically by means of the device sketched sectionally in Fig. 3. The tube  $e$  is depressed or released by means of an ordinary pedal, and according to the position of this tube the piston  $c$  in cylinder  $a$  takes its place higher or lower, and the piston-rod  $b$  actuates shaft O (Fig. 2). The fluid used to this end is the lubricating oil of the motor, which under pressure from a pump rises into cylinder  $a$ , driving the piston  $c$  before it

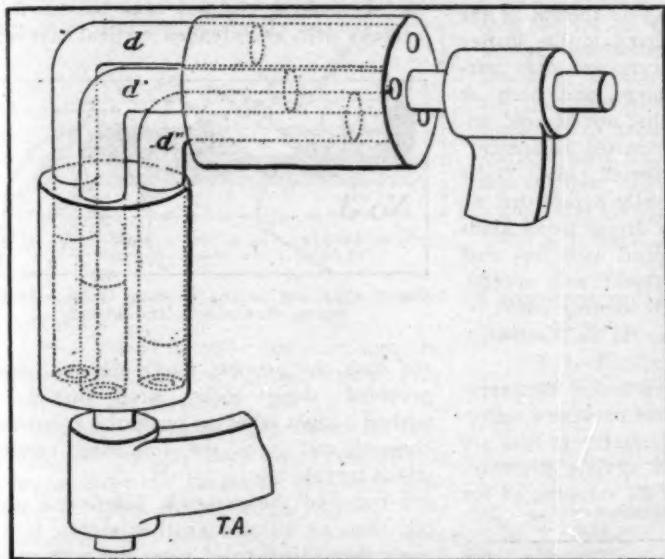


Fig. 4—The Brun jointless mechanical movement for transforming gas pressure into rotary motion

until it comes opposite to two openings in the sliding tube  $e$ . In this position it is forced to remain, as there is no longer any exit for the oil above it. But when tube  $e$  is moved, piston  $c$  follows, actuated either by the oil pressure, to effect a shorter stroke, or by resistance of the work, to effect a longer stroke.

The reverse in the test wagon is effected by means of having two large bevel gears instead of one on the rear axle and by shifting the bevel pinion on drive shaft from one to the other. From *Allgemeine Automobil-Zeitung*, December 8.

**NEW MECHANICAL MOVEMENT.**—Louis Brun has produced a mechanism which may be used as a motor or as a transmission and may be operated by gas, steam or a liquid, and which transforms an alternating piston movement into the rotation of a shaft or the rotation of one shaft into piston movements and then into the rotation of another shaft at right angles with the first one, and all without the use of piston rods or other joints, cranks or levers. The inventor thinks the mechanism ought to be applicable to automobile construction, but is at present seeking to develop it on the lines of a compound steam engine.

To understand the movement by which these things are accomplished, imagine a cylindrical barrel with a number of bores, like the cylinder of a revolver, and in each of the bores a long piston. Imagine another similar barrel at right angles with the first one and the pistons in its bores each made integral with one of the pistons in the first barrel, as may be done by placing the bores pairwise in the same plane parallel with the plane laid

through the axes of the two barrels. A pair of pistons now form an elbow, and if a pull is applied diagonally at the elbow of the pair of pistons  $d'$  in the accompanying illustration, for example, both the pistons composing the pair can be pulled out in their bores, as the barrels are free to turn. But when  $d'$  reaches the position of  $d$ , it cannot be pulled out any further, as the two bores in which the pair of pistons move are now as far apart as possible. But, if the rotary motion of the barrels is continued, the pair of pistons will move back into their bores until they reach a position between that of  $d''$  and  $d'$ , provided the friction in the bores is small enough; and, as all the three or more piston pairs follow the same law, they all pass around each other and around the shafts of the two barrels without interference. As regards friction in the bores, while it seems at first glance that the barrel, acting at right angles against the sides of a piston, might not cause it to move in or out, the matter is seen differently when it is noticed that each barrel, as it rotates, acts at an advantageous angle to push in or out that leg of a piston which moves in the other barrel, and this action is, of course, reciprocal, so that it is really the action of each barrel upon the pistons in the other barrel which renders the whole movement possible.

In practice, so far as practice has gone at this writing, the bores at the end of one of the barrels pass in succession before an orifice for the inlet of steam or gas under pressure and an orifice for the exhaust and the pistons are hollow, so that the gas gets into the corresponding bores of both barrels at practically the same time, and the pressure to drive the pistons out is applied, one might say, at the interior of the elbow, diagonally, as the resultant of two pressures at right angles. And in this application it is again true that, but for the advantageous angle at which the pressures upon one leg of a pair of pistons act upon the other leg of the same pair to make it turn the barrel in which it is housed, the movement would scarcely be possible, as the forces would be consumed in the dead resistance of materials.—From *La Technique Automobile*, November 15.

**SHACKLE-OILING DEVICE.**—In the production of small cars to be sold at a low price in competition with the feared American importations, European designers show a tendency toward simplifying parts constructively rather than by an improved organization of the production methods. Instead of providing the spring shackles with replaceable bushings and a regular stauffer or oilcup, a well-known parts-making firm of France proposes a self-greasing shackle bolt, as illustrated herewith, in which the bolt head is threaded to receive a grease cap, while the bolt is bored longitudinally with a lateral aperture connecting the bore with a groove in the wearing surface. An elastic splitting serves to hold the cap from coming loose. It seems unfortunate that atmospheric pressure will prevent the grease from feeding from the cap to the bolt after the first supply is used up, unless the cap is first removed, refilled and again screwed home. Illustration from *Revue de l'Automobile*.

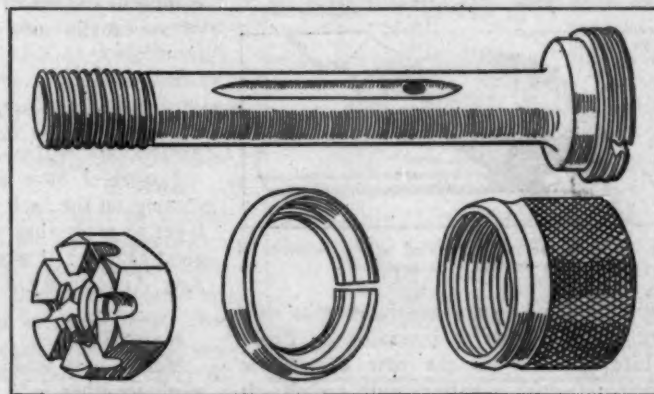


Fig. 5—Self-greasing shackle bolt for cheap cars

## Letters Answered and Discussed

### Rubber Hose Rots

EDITOR THE AUTOMOBILE:

[2,977]—On my auto, new last July, the rubber hose connecting radiator and motor is badly rotted by oil or heat. Would any of the following methods remedy matters?

1. Painting with tar thinned with gasoline.
2. Varnish.
3. Shellac and alcohol.
4. Glue one or more thicknesses of cloth around hose and, when dry, paint with lead and oil.
5. Can you suggest something better?

G. E. M.

The accompanying sketches show the best steps to take with the rubber hose when it reaches the condition you describe. The hose is first coated with tar thinned by gasoline and then bound by a bandage applied over the tar in the manner shown in Figs. 1 to 5. The end of the bandage is sewed so that it will remain in place. Another coat of the tar is applied over the cloth which may be taken from an ordinary surgical bandage. When this is dry a final coat of the tar is given. This will be found to resist the rotting effect and be a cheap repair to make. If done carefully it will be very durable. The first coat of tar should be very thick.

### What Is Full Equipment?

EDITOR THE AUTOMOBILE:

[2,978]—I am a reader of your paper, and as such would like to have you give an opinion as to what constitutes full equipment for an automobile, and say what I might reasonably expect to have furnished me under the representation when a car is priced to me at a certain figure, saying "fully equipped," without mention being made of what that equipment consists of. There are a number of makes of cars which include in their price, which is named for the machine fully equipped; top, dust cover for top, wind shield, speedometer, horn, robe rail, foot rail, complete set of



Fig. 1—The hose is first coated with a solution of tar softened in gasoline

five lamps, and where gas lighting is used they furnish either a generator or Prest-O-Lite tank, or in the case of electric lighting, furnish a battery with switch. It seems to me that there is altogether too

*The Editor invites subscribers to communicate their automobile troubles and personal experiences, stating them clearly on one side of the paper. If the nature of the case permits, send a sketch, even if it be rough, in order to assist to a clearer understanding. Each communication will receive attention in the order of its receipt, if the writer's signature and address accompany it as an evidence of good faith. If the writer objects to the publication of his name, he may add a nom de plume.*

much misrepresentation among automobile dealers, which appears to be abetted by the manufacturers, with regard to the matter of equipment, and if cars are only partially equipped with lamps and horn as some are, why should that not be sold under the statement of "limited equipment" instead of misrepresented as "fully equipped," when it is really a fact that no car can be satisfactorily driven in all kinds of weather unless equipped with top, dust cover for top, wind shield and speedometer, in addition to full lighting outfit.

L. E. KEMPER.

St. Bernard, Ohio.

This point is well taken and it does seem as if there should be some concerted movement on the part of manufacturers who are farsighted enough to be against misrepresentation to standardize the meaning of the



Fig. 2—A bandage of cotton cloth is then wound spirally about the hose

term fully equipped. Until such a thing is done it remains for the purchaser to be governed more by the list of specifications than by such vague representations as fully equipped, full set of tools and other phrases of an equally indeterminate nature.

### How to Coat a Mirror

EDITOR THE AUTOMOBILE:

[2,979]—I have a mirror on which the coating on the back is about off. What can I get to apply that will make the mirror as good as new? I would like to hear through THE AUTOMOBILE.

E. F. CLAPP.

Marshall, Ill.

Melt 1 part lead, 1 part tin, 2 parts bismuth together, add 4 parts of mercury at 212° F. and mix. Apply while warm.

### Trouble with Sight Feed

EDITOR THE AUTOMOBILE:

[2,980]—I will consider it a great favor if your paper can give me a little light on the following oiling question:

I have a four-cylinder engine oiled by the splash system. The base is divided in half and the level in each compartment is supposed to be maintained from a gravity oiler attached to the throttle. The only means of determining the level of oil (before I made a change) was by overflow petcocks with an extended vertical tube into

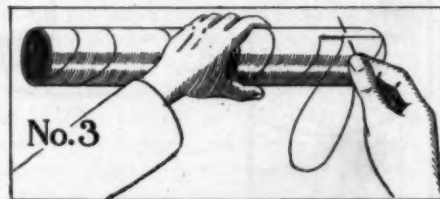


Fig. 3—The end of the bandage is fastened by means of a needle and thread

the base, to prevent too much oil being provided these cocks were turned. I wished a sight level, so made the following changes and have the following results, which trouble me:

I removed the pet-cock, inserted a nipple, then an ell and another nipple, in  $\frac{3}{8}$  pipe; then raised to  $\frac{3}{4}$  pipe, and with these fittings inserted a sight leveler, the inside diameter of the glass tube being  $\frac{3}{8}$ "; the smallest inside diameter of any of these fittings is  $\frac{3}{4}$ ". The height of the leveler is 3", the oil level being about  $\frac{3}{4}$ " from the top, and in which I bored a  $\frac{3}{64}$ " hole.

My trouble is that the oil does not seem to seek its level properly. It does not act the same always apparently. At times it will be too high in the glass, other times too low, when the conditions are unexplainable from use of oil or leak, etc. At times pouring oil into the breather pipes does not affect the level in glass at all. I have tried cleaning out all the pipes, with compression on and off, with breather open and closed, with holes in the top of leveler closed and open, and cannot get satisfaction.

Is this scheme practical? Should I have larger fittings, a higher leveler, more atmospheric pressure?

I consider it essential to see the oil in the base. Working on this principle, can you help me? I will be greatly indebted to you if THE AUTOMOBILE can advise me.

WM. U. HARRIS.

Mobile, Ala.

The trouble is probably with unbalanced pressures on the top and bottom of the

sight feed. If you will lead a small tube from the top back into the crankcase so that the pressures will be balanced the trouble should disappear. If the trouble is not due to this it is probably caused by an airlock in the piping owing to a vertical bend.

### To Fit Magnetos

Editor THE AUTOMOBILE:

[2,981]—I have a touring car of the old two-cylinder type, located in horizontal position under the car body. The car is in A-No. 1 condition and would like to add a magneto to its equipment.

In using a magneto would I need an extra coil outside of the one I am now using in connection with a set of dry batteries?

What is best to use, a low tension mag-



Fig. 4—A coat of tar is then applied over the fastened cotton cloth bandage

neto with coil, or one of high tension without it?

What should be the relation of speed between either the low or high tension magneto and the motor?

Can buy fittings and gear from the manufacturers of my car, but would like to buy a different magneto, use their gear, and probably make fittings myself. The magneto they offer seems rather expensive.

Any advice you can give in the way indicated above will be greatly appreciated.

READER.

Iowa Park, Texas.

With a low tension magneto you would not need an extra coil but could use the one you are using with the batteries. It would be a cheap and satisfactory job to use this type of magneto. The magneto would be cheaper than the high tension type. The speed at which the magneto must be driven depends on the number of cylinders; in your case the best arrangement would probably be to drive the magneto at the same speed as the crankshaft.

### More Ignition Trouble

Editor THE AUTOMOBILE:

[2,982]—I would greatly appreciate a little information on my Remy ignition. I have a high tension magneto and a non-vibrating coil. Some time ago the three wires leading from coil to distributor got broken and caused short circuit. I cut them off and made a splice which seemed to work well. However, I afterward found a short circuit in distributor housing. I got a new platinum spring and adjusting screw: they seem to go all right for 15 or

20 miles, then the motor will skip and miss fire. I have watched it in the dark; it will show a lot of fire in distributor housing and the platinum points seem to get dirty. If I take them out and clean them, it will run all right again for a short time. I have a Schebler T carbureter and motor in good condition. I follow the direction book as near as I can in making the adjustments.

In splicing the wires I cleaned them off good, about 2 inches of each end. I wound the ends around each other and soldered, then I wrapped with common twine, then slipped a tight-fitting rubber tubing over twine and then wound with tape. Is that kind of a splice all right? I saw your directions of how to make a splice in THE AUTOMOBILE.

J. F. HEALY.

The trouble is probably due to the fact that the spring makes too heavy a contact in the distributor box. In reality there should be no contact at all in the distributor box, but the current should leap a small gap of about  $1/64$  inch. If there is a contact made the points will be shaved off and the dust will cause a short circuit after a time and give out the fire which you notice. The splice you made is all right.

### Concerning the Weight Problem

Editor THE AUTOMOBILE:

[2,983]—Kindly give us some information as to the weight of automobiles. About how much should a car, 6 cylinder,

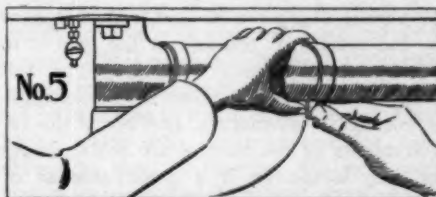


Fig. 5—A clamp which is fastened by means of a wing nut holds the hose in place

40 or more horsepower, four or five-passenger capacity, built of selected materials weigh, to be amply strong to give good service and take the hills mostly on direct drive in a hilly country like Pennsylvania? It appears to me that a great many cars of 40 or more horsepower are unduly heavy and could not perform any better on hills than a 20 horsepower runabout weighing say 1,750 pounds with two passengers. Is there good reason for increase of weight with increase of horsepower, when the load or carrying capacity remains the same; in other words I am after quality without increased avoirdupois. Kindly explain this matter and oblige.

F. LYONS.

The opinions of makers vary to a considerable extent as to the best weight. For a car of the size that you mention, the average would be in the neighborhood of 3,500 pounds. It must be remembered that roominess in a car means added weight and this requires added horsepower to carry it. The added horsepower means increased engine weight, so that for a small increase

in the size of the car a considerable added weight is required to make it as relatively high powered as the smaller car. The problem then is self-evident when it is considered that the heavier engine and material are the price paid for the added comfort due to the increased amount of room. The weight problem in this country is an entirely different proposition to what it is abroad. The flatness of the roads in certain parts of the country make it a waste of money to buy a car which is equipped with a motor of high horsepower. It is for this reason that the cars having motors which are about 12 horsepower or thereabouts are so popular. These light motors are entirely sufficient to pull a fairly large car over level roads, but in this country they would be stalled on the hills.

### Wants Timing of Motor

Editor THE AUTOMOBILE:

[2,984]—I would be pleased to have you send me the timing of my two-cylinder car. I wish you would give me the timing by piston travel, and not by degrees, for I have not got the tools to figure the degrees. The bore is 5 inches with 5-inch stroke and is a slow speed motor. Please show also where the spark should be set.

ALFRED F. THURMAN.

Ft. Wayne, Ind.

It is impossible to give the timing accurately in piston travel as 10 degrees on a circle of 5 inches in diameter would give about .173 inches in piston travel. If you will take the diagram shown at Fig. 6 and copy it so that it is enlarged to the size of your flywheel, it will not take any complicated tools to mark the flywheel for each cylinder in the same manner as is shown in the diagram. Put each of the cylinders on upper dead center and put a mark on the engine frame to correspond with the mark on the flywheel. Then turn the engine over slowly and when the mark, for instance, of the inlet opening of cylinder 1 comes opposite the mark on the frame or other stationary part of the motor, set the valve so that it is just about to open in the cylinder. The other settings are made in the same manner. The spark advance is also shown on the diagram.

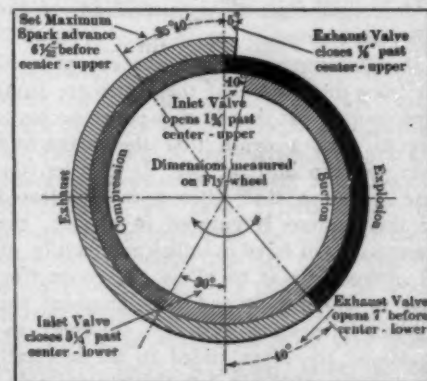


Fig. 6—Timing diagram by degrees. A piston travel diagram may be constructed from this

# Little Bits of Motor Wisdom

## Pertinent Pointers of Interest to Repairman and Driver

**NON-CIRCULATING FORCE-FEED**  
—When the oil in a force-feed lubrication system is not recirculated the feed is given drop by drop. When fed in this way there is a sight feed for each lead through which the number of

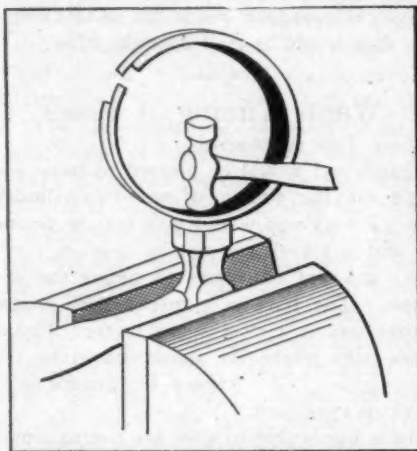


Fig. 1—Peening a piston ring between the faces of two hammers

drops per minute may be determined for each bearing. The sight feeds are capable of adjustment and by simply screwing a small knurled nut the correct amount of oil may be allowed to pass to the bearing. A common means of regulating the flow with force feed systems of this type is to have a by-pass fitted to the pump through which varied amounts of oil may be allowed to pass back to the reservoir. When the greatest possible amount of oil is allowed to pass through this by-pass there will be just sufficient oil passing through the leads to lubricate the motor under conditions when the oil required is a minimum, that is, on asphalt or other smooth level roads at low speeds. When the by-pass is closed off the full capacity of the pump is utilized in forcing the oil through the leads to the different bearings.

It is necessary to drain the accumulated oil from the bottom of the crankcase from time to time so that it will never accumulate to such a depth that the connecting rods will dip into the oil. It is often the case, however, that when a car lubricated by this system is entered in a race, the crankcase will have a sufficient quantity of oil poured into it to allow the connecting rods to dip into it and thus augment the regular lubricating system. Different innovations are often added to the lubricating systems of a car, but the general principles of the different systems will be found to be along the lines laid down for

either the splash, force-feed or combination systems.

**BALL AND ROLLER BEARINGS.**—Apropos of the subject of lubrication, some mention might be made of the lubrication of the special bearings which have now become almost universal in certain parts of the motor and power transmission. The purpose of these bearings is to reduce the friction surface to a minimum and at the same time to maintain the necessary strength at the particular part that is supported by the bearing. It is evident that the grease used must not interfere with either of the two functions of the bearing in order that its full efficiency will be attained and that no wear will result owing to the insufficiency of the lubricating material.

It may seem paradoxical, yet it is a fact that the most important function of the lubricant used on ball and roller bearings is not their lubrication. The truth of the matter is that on a ball bearing the amount of lubrication required is so small as to be almost negligible, as the friction caused by the rolling of the ball in the race is in itself a very minute quantity. The ball rests merely upon a point of theoretically infinitesimal dimensions, and hence the requirements of the oil film are not so heavy as they would be if a great amount of metal was in contact with the bearing surface. The oil in a ball bearing race is often carried for a very extended period of time without renewal, and at the same time no harm will result to the part from this cause. This would tend to further illustrate the fact that the oil is not put to any arduous task, since if this were the case it would soon be exhausted.

The prime duty of the oil or grease film which surrounds each ball or roller in a set of ball or roller bearings is to put a rust-proof casing about the bearing which will protect it from the inroads of this enemy of metal. The slightest trace of moisture about an unprotected surface will cause an accumulation of the disastrous oxide. This will form an irregularity in the surface of the ball, giving rise to ridges and hollows. Sooner or later the ball will become turned in its cage and the weight taken upon one of these ridges which are formed upon the surface of the ball or roller. When this occurs the ridge will be crushed and a dust formed which will in a short time cut the surface of the balls to such a degree that their period of usefulness will soon be ended.

The secondary duty of the grease, while not so essential, is of a sufficient degree of importance to be a factor in the longevity of the bearing. The balls rub against the separator, while the rollers also bear against their axes as well as against the cage. The friction due to this contact should be reduced to a minimum so that lubrication is essential if only at these points. The bearings should not be neglected even if the lubrication problem is simple, for pieces of solid material are wont to work their way into the races and produce the same effect that the rust would have. The cages should be occasionally cleaned out and not neglected. This is an important feature of the overhauling of a car.

**PEENING PISTON RINGS.**—The peening hammer should be called into use instead of the various flat-headed types that are

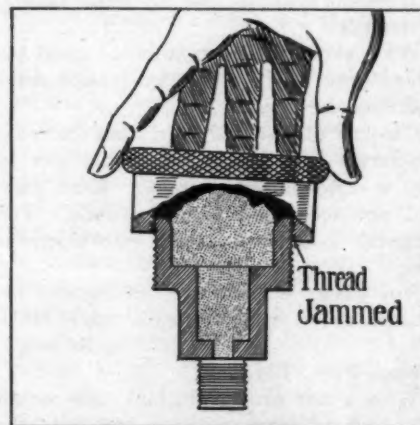


Fig. 2—How the threads are jammed by misplacing the cap of the grease-cup

used at times for peening a piston ring. The metal may be more readily distributed by the blows from a peening hammer, which can be directed better, since the head of the hammer is so designed that a large part of the surface is not covered at one time nor struck by any single blow. In this manner slight changes in the shape of the metal may be made without distorting the material in any way. It is very important in any peening operation that the surface upon which the hammering is done be as flat and hard as possible, for any irregularities in the shape of the surface plate will be just as effective in causing distortions as a blow from a badly-shaped hammer. A good method of providing such a surface plate where the operations of this nature are not often carried on and there is no occasion for going to the expense of putting large fittings into the shop is shown in Fig. 1. A vise is

clamped about a flat-face hammer which is upturned so that the ring may be rested upon it and hammered as shown. In this way the metal will not be injured and a very satisfactory piece of work may be performed.

**CARE OF GREASE CUPS.**—The threads on grease cups are very often defective owing to the fact that they are not as carefully made as the utility of the cups would justify. This defection in the formation of the thread and the carelessness often displayed in putting the caps in place is the cause of no small amount of harm. If the threads are crossed as shown in Fig. 2 a resistance will be offered to the turning of the cap and the operator will be under the impression that he has tightened up on the cup sufficiently to feel the pressure of the grease, while in reality the pressure will be caused by the resistance offered against turning by the incorrect engaging of the thread. It is therefore of prime importance that the cap of the cup be placed upon the body squarely, as parts provided with grease cups generally require considerable care in the way of lubrication.

Grease cups are very apt to become

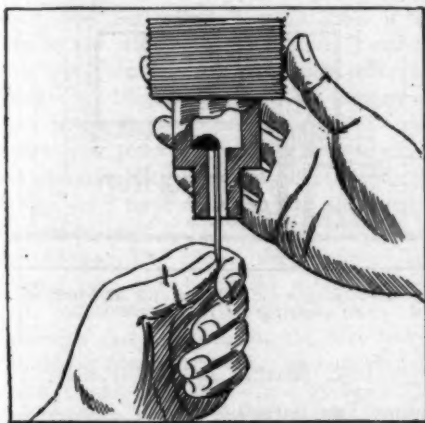


Fig. 3—Where the dirt in a grease-cup is apt to lodge and how to remove it

clogged, as shown in Fig. 3. In this manner a great amount of harm may be done before the trouble is located. It would be a good precaution to observe if the cups were removed and a wire run through the tube occasionally in the manner shown in Fig. 3. There is a small ledge within the grease cup, which may be seen in the illustration, upon which the particles are often caught, and in this case they are very hard to remove even with a wire.

**CARE IN CROSSING FERRIES.**—The recent accident which happened on one of the New York ferry boats should be ample food for reflection regarding the dangers of leaving the machine unattended when it is on one of these vessels. It seems that the motor of this machine had been started up and that the jar of the boat in striking the slip threw in the clutch, whereupon the

car dashed through the crowd collected at the front end of the boat and threw one man into the river, causing his death, besides breaking the leg of a youth who happened to be in the way of the machine on its wild career. While there may be room for doubt as to the accuracy of this explanation of the accident, for it is hardly possible that the jar of the vessel would throw in the clutch and keep it in, still at the same time it is a fact that the machine did run away, plunged to the bottom of the river and drowned an innocent bystander. The motor, no doubt, was cranked while the gears were not in neutral.

The car should always be carefully guarded while crossing a ferry, for it is subjected to the caprices of the vehicle standing either in front of it or directly behind it. Hence it is necessary to be as careful in this position as when on a crowded street. The driver should never leave his automobile and wander about the vessel, as is often done where the trip is of considerable length. If there had been a car in the path of the one which caused the accident it would no doubt have gone overboard also had some one not been there to guard against such an accident.

**IF THE GEAR CASE LEAKS.**—Often the leakage of oil from the gear case where the two parts are joined together and around the stuffing-box where the shaft comes through is puzzling, to say nothing of the annoyance it causes in keeping the outside of the case smeared with oil and grease. This may still happen after the gaskets have been renewed, and the driver will be at a loss to discover the reason. One theory which may be advanced for this leakage is that, in running, the gear and housing become slightly heated, causing the air in the casing to become heated also and expanding it. This expansion produces a certain pressure within, and forces the oil out through the cracks. To counterbalance this pressure, a small hole may be drilled somewhere in the top of the gear case so as to admit the outside air. The atmospheric pressure will then oppose the pressure produced within the case and should stop the leakage. This air hole should be drilled in the top of the gear case so that there will be no possibility of oil getting out through it.

**WHEN THE NEEDLE VALVE LEAKS.**—The carbureter needle valve will occasionally need grinding in the same manner as the poppet valves in the cylinder of the motor. A leaky needle valve may be detected by the smoke which the motor will give forth while running at low speeds, owing to too rich a mixture. The air in passing the needle valve creates a suction which draws the gasoline from the reservoir in the bottom of the carbureter and carries it past the needle valve in the form of a spray, and when this valve is choked or is in a

leaky condition there is either too little or too much gasoline supplied to the engine. The weak mixture generally makes itself felt by the popping back into the intake pipe which takes place under these conditions.

**WHEN WORKING BENEATH THE CAR.**—While not so often necessary as in the early days of motoring it often is required that some work be done beneath the car. When this becomes necessary, the usual proceeding is to jack up the car and set to work.

Jacks are not always infallible and it is a very wise proceeding to guard against serious accident by blocking up the car after it has been raised by the jack to a height at which it is convenient to work. A block of wood set on end between the ground and the rear axle will be sufficient for this if the work is being done at the rear end of the car as it most generally is in the case where it is necessary to block up the car for a distance sufficient to work beneath it.

A very handy device has been brought out by means of which the workman may lie comfortably upon his back while engaged upon the work beneath the car. It consists of a flat cot with a slight raise for the head so that the neck will not become severely strained while working at an unnatural inclination. The tools may be placed on the cot alongside of the workman where they will be handy to his reach whenever he may want them. The device rests upon wheels so that the operator can push himself to whatever position he may desire beneath the car.

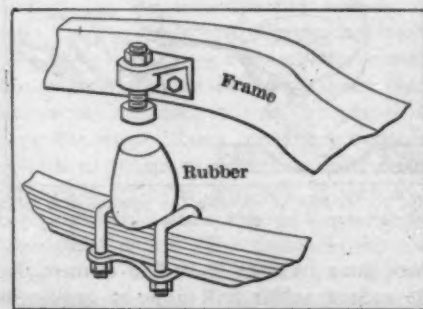


Fig. 4—A rubber insert used to cushion the fall of the body on a rough road

**SUSPENSIONS OFTEN HARSH.**—It is very often the case that while a car rides very easily over the lighter bumps and jounces in a road it will prove exactly the contrary where going of only ordinary roughness is encountered. The cause of this is that the springs are extended to the limit of their capacity, and when the car cannot spring any further the shock is taken up by metal instead of some more elastic material. For this reason in such cars it is very good practice to place a rubber insert at the point shown in Fig. 4. When this is fitted the shock caused by the spring reaching the limit of its throw will be minimized.

## My Best Repair

### An Ingenious Repair

EDITOR THE AUTOMOBILE:

Your article in the November issue (No. 2934), headed "Wants Soldering Information," brings to my mind a repair that was made on a leaky gasoline tank, while I was on a trip in Maine for from a garage. Possibly an account of this repair may prove interesting to some of the readers of THE AUTOMOBILE.

The tank referred to, a rectangular galvanized iron affair, had four partitions fastened inside to keep the gasoline from splashing from end to end. These partitions were riveted through the bottom and sides of the tank, and solder was placed around the rivets. Constant jarring worked two of these rivets loose in the bottom of the tank, and the gasoline ran in almost a stream from one and dropped very fast from the other.

I tried in vain to stop the leaks with soap, but the jar of the machine and the working of the rivets made this impossible. Now, it is a generally understood fact that when soldering with a copper or torch, the

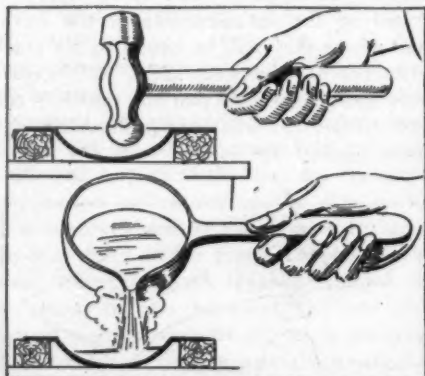


Fig. 1—Method of cupping the patches and filling with solder

work must be done in such a manner that the melted solder will flow by gravity to the place which is to be filled or covered. Melted solder will not flow uphill.

Obviously, the accepted way to repair such a leak in the bottom of the tank is to remove the same, turn it bottom side up and flow solder around the rivets. In this particular instance it would have been necessary to disconnect the wiring, detach the mudguards from the body, and remove the body before the tank could have been taken off.

All this looked like too much of a job to me, and would have delayed my trip a day or two.

I had no soldering copper, but did have some solder and soldering paste, so went to work to solder up under the tank without removing it from the machine. A

*Temporary automobile repairs made by the driver or owner while on the road and permanent repairs made in the garage after the run is over, are interesting to all automobile owners.*

*It may be a spring leaf has broken; a shackle bolt or strap may break; a steering tie rod is bent; the car skids into a curb and bends a steering arm or the starting crank; a throttle or magneto connection breaks owing to vibration; a radiator leak is started by a stone or some other means; a leak in the gasoline tank is discovered; there is a small hole in the gasoline feed line; a brake facing may burn out; a brake connection breaks; a front axle gets slightly sprung; a clutch starts slipping, or any one of a thousand things may happen.*

*Every automobile owner is interested in knowing how repairs have been made, how long it took to make them, how much they cost, and by whom they were made.*

*We want you to write in simple language in a letter what repair of this nature you have had to make, how you made it, how long it took you and how much it cost.*

*You can make with your lead pencil one or two rough sketches indicating the broken or damaged part and showing how the repair was made.*

*The experience of each reader is interesting to every other reader. Analyze your past experiences and send in one or two of them.*

*Give your name and address, legibly written. If you do not want your name to appear, make use of a nom de plume.*

Editor THE AUTOMOBILE

blacksmith shop was located, and I obtained permission from the blacksmith's wife to use the forge, the blacksmith being away on a fishing trip.

To make the repair I proceeded as follows: All the gasoline was carefully drained off in cans furnished by the country grocer. By getting under the car the loose rivets could be reached, and I scraped a place clean an inch or two in diameter around each and applied a little soldering paste to the cleaned spots.

Then I found a bright, clean tin can and cut two pieces of tin about two inches square from it for patches. These patches were flattened out and then depressed in the center with a round-ended hammer, forming shallow cups about 1/8-inch deep. The patches were then treated with soldering paste, heated and filled even full of solder, which was then allowed to cool.

Next, two sticks an inch or less in diameter were cut just long enough to reach from the ground to the bottom of the tank, and one was used against each corner of the patch to hold it in place, wedging it solder side up against the tank over a loose rivet.

I then found a piece of iron with a flat end about an inch in diameter that could be pressed flat against the center of the tin patch between the two sticks. This iron was heated almost to a red heat in the

forge, and then pressed firmly against the tin patch. The solder melted in the shallow cup-shaped patch, and the spring of the sticks holding it in place caused the patch to be pressed firmly against the bottom of the tank. This forced the hot melted solder out around the edges of the patch. As soon as the iron was removed, the solder cooled and the job was finished.

There will be much less danger from gas explosions when soldering a tank with a hot copper or iron, than when using a blow torch. I would not recommend using a blow torch on a gas tank that had been but recently emptied, for the small amount of gasoline left would be sufficient to cause a serious explosion if ignited.

GLEASON WOOD.

Waltham, Mass.

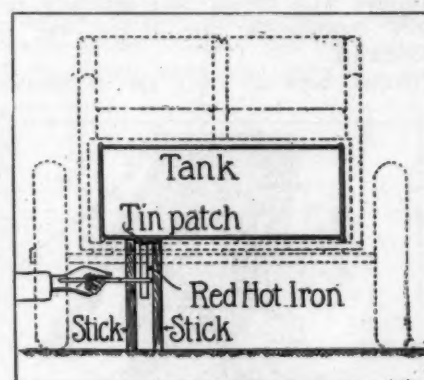


Fig. 2—Arrangement of apparatus and method of applying hot iron to patch

### Too Much Lubrication

EDITOR THE AUTOMOBILE:

Early last fall I took a long tour, after which my car was thoroughly overhauled and allowed to stand in my garage without use for about two months. When I attempted to start the motor again I was able to get only a very weak spark which was not sufficient to ignite the cylinder charges. I had never had any trouble of this nature before, and was somewhat at a loss to determine what the trouble was. The wiring was gone over thoroughly, the spark plugs being cleaned and the vibrators inspected, but these operations were of no avail. The engine would not start. As a last resort, I decided to take the magneto apart. Inspection of its parts after removing the cover disclosed the fact that a film of dried oil and dirt had formed at the back of the distributor, either partially grounding the current or offering greater resistance. After cleaning off this coating and replacing the motor started at once.

B. L. R.

Albany, N. Y.

# My Ideal 1912 Automobile

## Readers' Conceptions of What This Year's Car Should Be

### Has Two Ideals

#### EDITOR THE AUTOMOBILE:

As I have had the pleasure of touring abroad, I find it difficult to reconcile myself to American road conditions and to the higher-powered and heavier American automobiles which such conditions make necessary. The average foreigner who comes to this country marvels at the high-powered and rather cumbersome machines here until he has attempted to negotiate the poorer roads with a light car. After one such experience, he immediately sees the reason for the heavy types in vogue.

The point which I am trying to make is that the ideal American automobile for this year would cease to be ideal if taken abroad. The price of gasoline in England is very high, and the operation of the larger American motor there would be nearly prohibitive, because it requires too much fuel per mile. This in itself is an item of no small consideration. Further, it is not necessary to have such powerful engines in England and on the continent, as a 20-horsepower touring car will give entire satisfaction on nearly all roads which the automobilist encounters there.

And so, I have an American ideal and a European ideal. The former runs about as follows: The motor should be of the T-head type, this being the more symmetrical construction. It should have six cylinders, cast in pairs, and the horsepower should be around 50. The cylinder dimensions should be 5 inches by 7 inches. The long stroke motor seems to be gaining ground rapidly, especially in America.

Bosch dual ignition system seems to be best for all conditions of operation, although there are several other types which have almost equal merit. The motor and all other parts of the car should have ample provision for positive lubrication. For the engine, there should be a combined force feed and splash system, with the crankcase so designed that a constant oil level would be maintained therein.

The clutch should be of the cone type, and it should be of large diameter, leather faced and containing cork inserts. These inserts should be of large size, and their springs should be of sufficient strength to insure their helping to grip the male cone-member. They should be of some use, and not added merely as a selling feature. The transmission should have three speeds forward and a reverse, as I believe with other of your readers that there is no special advantage to be gained from the use of four forward speeds. It is, rather, a com-

*Readers continue to demonstrate their interest in the ideal car and the specifications which are submitted show a wide range of taste and requirements. In view of the interest shown the Editor continues to extend the invitation to all who entertain ideas on this absorbing topic, to submit their opinions for publication. The description should be legibly written on one side of the paper and signed by the sender, although if it is so desired the name will not be published.*

plication which can be avoided. The drive should be by shaft and worm for greater silence.

Springs all around should be of the semi-elliptic type and the wheelbase should be about 137 inches. This would give ample leg room in the tonneau and front seat. Large tires should be included, say, 36 inch by 5 inch. The rear axle should be floating, while the front one should be of the B. & L. Castor type.

Center control has a number of advantages which I think would warrant its adoption in this car, the chief one of these being that it allows easy access to the driver's seat from the right side of the machine. On the dash there should be a lever for the control of an auxiliary air valve, as well as provision for the adjustment of the carbureter needle valve.

The body should be of the seven-passenger touring type, with foredoors and rigid straight lines. A cowl dash presents a classy appearance. None of the accessories should be mounted on the running boards. This applies also to the acetylene gas tank, which should be carried elsewhere, as well as the extra tires. These latter should be carried on the back, so as not to be an obstruction on the running board.

A very good form of rear tire-carrier is that adopted by the makers of the Knox. This should be placed under the car body where the gasoline tank is sometimes carried. The tank should have a capacity of 30 gallons and should be located under the front seat. On the dash there should be a gasoline gauge which would indicate at a glance the amount of fuel in the tank. There should also be a small auxiliary gasoline tank, carrying 2 extra gallons of gasoline, for use in emergency to run the car to the nearest supply station.

The car should be equipped with a compressed-air self-starter, electric lights, demountable rims, speedometer, clock, electric horn, tire inflator, angle windshield and other standard equipment.

The price of this car complete should not exceed \$4,000 at the outside.

G. F. R.

New York City.

### Sub-Frame for Engine

#### EDITOR THE AUTOMOBILE:

I herewith submit my description of what I term my ideal 1912 automobile:

1. Running gear: The frame is to be of channel section with the engine and transmission resting on a sub-frame. It is to be of underslung construction, and the wheels are to be 38 inches in diameter with 4½-inch Miller tires. Both axles are to be of Timken manufacture, the rear one being of the floating type. From the axles the frame is to be suspended by semi-elliptic springs. (Other types are known to have been used, but not to advantage.) The steering mechanism is to be of the irreversible type with two sets of brakes on the rear wheels. The brake drums are to be about 18 inches in diameter with a 5-inch face, one set being internal and the other external expanding. The wheelbase is to be such that comfortable riding is assured; that is, from 126 inches to 130 inches.

2. Motor: The motor is to be either a six-cylinder, 45-horsepower one, or a four-cylinder, 50-horsepower, with a stroke of from 6½ to 7 inches. The flywheel is to be located in the rear with a combination cone clutch, leather faced with cork inserts, and an expanding cone or ring clutch. A six-cylinder motor must have its cylinders cast in threes and a four-cylinder in pairs for simplicity. A combination force feed and splash oiling system is to be used. The engine bearings are to be Hyatt Non-Burnouts, and each of the pistons is to have five rings. Long connecting rods are to be used to insure flexibility. A Rayfield carbureter is to be included, as well as a honeycomb radiator of large capacity and centrifugal pump. The transmission is to be selective with four speeds forward and a reverse, and it is to be supported in the center of the car by the same sub-frame as that which supports the motor. It is not to be a part of the rear axle.

3. Body: This is to be open and of a type to suit the purchaser. My preference is a six-passenger torpedo, electric lighted throughout, and fully equipped with electric self-starter, Dorian demountable rims, Stewart & Clark combination speedometer and clock with electric light, Newtone electric horn, automatic windshield, silk mohair top, etc.

According to my figuring and estimating, this car can be produced for \$1,850 to \$2,500, leaving ample profit for the manufacturer and commission for the dealer.

MARTIN C. RADLER.

Brooklyn, N. Y.

# Automobile Metallurgy Made Easy

By E. F. LAKE

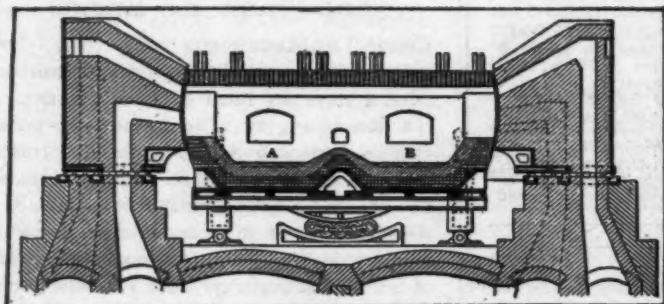


Fig. 1—Stationary single open-hearth furnace

## Part VII Open-Hearth Steel

(NEXT WEEK—CRUCIBLE STEEL.)

**I**N MANUFACTURING steel with the open-hearth process, the ore is melted in one ore furnace and the molten cast iron taken from it in the same way as it is with the Bessemer process. It is then poured into furnaces with a hearth, as the name implies, and a flame is kept circulating over the top of the bath to cause the metal to boil and throw off its impurities. To aid this iron ore and limestone are occasionally charged into the furnace. In Fig. 1 is shown a sectional view of a late design of the single hearth, stationary, regenerative, open hearth furnace that is used for steel making. In removing the finished steel from this furnace a hole is tapped in the side to allow it to flow into ladles. The carbon is not all burnt out, as in the Bessemer process, but enough is removed to reduce it to the correct percentage. Sometimes the excess carbon is oxidized out enough to bring it a little below the percentage of carbon desired in the finished steel and then a sufficient quantity is added to bring its percentage up to the correct amount.

Underneath the furnace proper, and below the floor line, is located what is called the regenerator. It is a great saver of fuel, and by its use the steel made in this furnace was considerably cheapened. Here the exhaust flames pass through series of honeycombed brickwork that retain the spent heat. When enough heat has been stored up in this way the incoming gas is turned through this honeycombed brickwork and superheated before passing over the molten metal. It thus carries with it the stored heat from the spent gases. When this brickwork is cooled the gas and flame are reversed to the other side, and thus the operation of storing the heat and using it again is continuous.

In Fig. 2 is shown a furnace with a double hearth and apparatus for mechanically tilting. With this the metal can be made to flow out of a spout that is provided, and thus it is not necessary to tap a hole in the side. The regenerator apparatus underneath is the same as that shown in the stationary furnace in Fig. 1.

In the open-hearth furnace the air or flame does not pass through the metal, and thus fill it with gas, as is the case in the Bessemer converter, but it does pass over the top of the bath, and hence the metal might absorb these gases. The molten metal, however, is covered with a good layer of lime or other materials. This prevents the flame from coming in contact with the steel, and the materials used are such that while the metal is being

boiled the impurities in it rise to the top and enter this covering or slag. By using the proper slags the phosphorus and sulphur, which are very injurious to finished steel, can be removed to a much lower percentage than with the Bessemer converter. Occluded or segregated gases are also held to lower percentages. While teaming it into the ladle, as with the Bessemer process, scavenging materials, such as titanium, vanadium, aluminum, etc., can be used to further reduce any gases that might be retained in the metal, as well as any portion of slag that might be left.

It will be seen that this style of furnace is more expensive to build than the Bessemer converter, and that slags have to be used to cover the bath, all of which makes it more expensive to operate. Recent improvements, however, bring the cost of steel per ton down close to the steels made in the Bessemer converter, and in many mills the converter is giving way to the open-hearth furnace. As the impurities may be reduced to lower percentage than in steels made by the Bessemer process, open-hearth steels can be made stronger and tougher than Bessemer steels.

Where the higher priced steels are not required open-hearth steel is nearly always specified for automobile parts. Open-hearth steels can be bought in the open market in many different sizes, shapes and brands, and with nearly any percentage of carbon, manganese, silicon, sulphur and phosphorus that is desired. Some automobile builders have never used any of the high-priced alloy steels, but have made all of their steel parts from O. H. steels.

It is possible to make as good steels in an open-hearth furnace as are made by any of the other processes. To do this, however, the first slag for removing impurities must be raked off the top of the bath, and one of a different composition, which will absorb other impurities, must be used in its place. This might have to be done several times to remove all of the impurities in the steel and the metal must thus be boiled a longer time than is customary when making ordinary open-hearth steels. This means that a greater amount of labor and material has been used and the steel made more costly thereby. Other processes are usually used, therefore, to make the steels of the very high grades.

Open-hearth steels that are fairly well made are not very expensive and have very good mechanical properties, such as tensile strength, torsion, etc. These are, therefore, as good

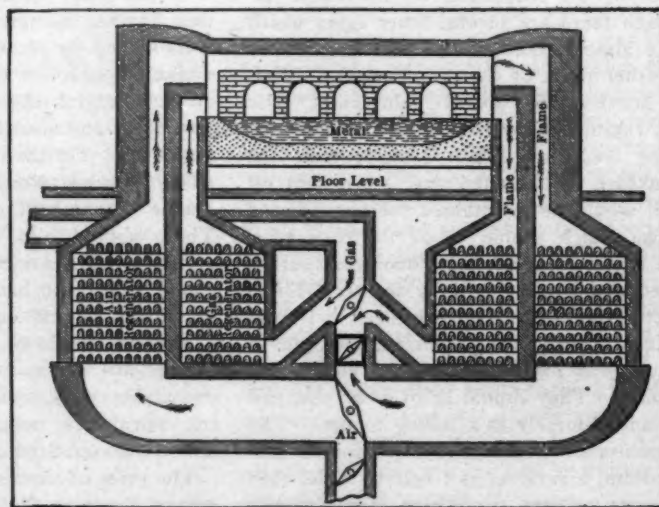


Fig. 2—Tilting double open-hearth furnace

steels as are needed for many parts of an automobile when they are properly rolled, forged, pressed, or otherwise worked into shape and when they have afterwards been properly heat-treated. The mechanical working and heat-treatment are of as much, and often of more, importance to steel than is the quality of the steel itself.

In fact, steels with the best of properties can be destroyed by improperly working and heat-treating them, or the highest possible strengths and wearing qualities can be given the metal if it is properly worked and heat-treated.

The various shafts have been made from open-hearth steel with success as well as steering knuckles, connecting and reach rods, valve rods, all of the different kinds and styles of gears and springs, universal joints, sprocket wheels and chains, frictional clutches, the various parts of the brakes, the frame, and in fact all parts that require steels with a good strength. The variety of kinds or brands of open-hearth steels is very large and hence it is not difficult to find one that is suitable for each of the numerous parts of a motor car.

The carbon content of open-hearth steels alters the strength, hardness and wearing qualities in the same proportion as shown in the previous article, on Bessemer steel. In open-hearth steels that are well made and have a high enough carbon content it is not difficult to obtain a tensile strength of 225,000 pounds per square inch or an elastic limit of 200,000 pounds. As steels are made in the open-hearth furnace with any desired percentage of carbon, the tensile strength and elastic limit vary from these to

ALTERATIONS IN STRENGTH CAUSED BY CARBON CONTENT AND HEAT TREATMENT.

Percentage of Carbon	Heat Treatment	POUNDS PER SQUARE INCH		PERCENTAGE OF	
		Tensile Strength	Elastic Limit	Elongation in 2 Inches	Reduction of Area
0.12	A	66,120	38,700	35	63
	B	71,300	39,720	20	61
0.20	A	99,000	81,000	18	59
	B	105,000	75,000	22	52
0.30	A	132,000	115,000	18	51
	B	195,000	175,000	9	31
0.40	A	88,000	55,000	29	52
	B	113,000	84,000	23	60
0.50	A	131,000	119,000	19	51
	B	210,000	190,000	10	37
0.50	A	120,000	70,000	18	37
	B	135,000	108,000	17	46
0.50	A	155,000	139,000	14	43
	B	225,000	198,000	18	24

the low figures obtained in the low-carbon-case hardening steels. In tensile strength, these run from 60,000 to 75,000 pounds per square inch, and in elastic limit from 38,000 to 45,000 pounds. A similar variation is also found in the elongation and reduction of area. The above table well illustrates the change in mechanical properties that can be made in open-hearth steels by the carbon content and also by the heat-treatment.

## Calendar of Coming Events

### Shows

- Dec. 30-Jan. 6....Buffalo, N. Y., Annual Show, Seventy-fourth Regiment Armory, Buffalo Automobile Trade Association.
- Jan. 2-11.....New York City, Hotel Astor, Importers' Salon.
- Jan. 6-13.....New York City, Madison Square Garden, Twelfth Annual Show, Pleasure Car Division, Automobile Board of Trade.
- Jan. 6-20.....New York City, Madison Square Garden, Annual Show, Motor and Accessory Manufacturers.
- Jan. 10-17.....New York City, Grand Central Palace, Twelfth Annual Show, National Association of Automobile Manufacturers; also Motor and Accessory Manufacturers.
- Jan. 13-19.....Milwaukee, Wis., Auditorium, Fourth Annual Show, Milwaukee Automobile Dealers' Association.
- Jan. 13-27.....Philadelphia, Annual Show, First and Third Regiment Armories, Philadelphia Automobile Trade Association.
- Jan. 15-20.....New York City, Madison Square Garden, Twelfth Annual Show, Commercial Division, Automobile Board of Trade.
- Jan. 15-20.....Toledo, O., Annual Show, Terminal Building, Toledo Automobile Dealers' Association.
- Jan. 22-27.....Rochester, N. Y., Annual Show, State Armory, Rochester Automobile Dealers' Association.
- Jan. 22-27.....Detroit, Mich., Wayne Gardens, Eleventh Annual Show, Detroit Automobile Dealers' Association.
- Jan. 22-27.....Providence, R. I., Providence State Armory, Rhode Island Licensed Automobile Dealers' Association, Automobile and Accessories Show.
- Jan. 22-27.....Dubuque, Iowa, Annual Show Dubuque Automobile Dealers' Association.
- Jan. 27-Feb. 10....Chicago Coliseum, Eleventh Annual Automobile Show, under the auspices of the National Association of Automobile Manufacturers. Pleasure cars, first week. Commercial vehicles, second week.
- Jan. 27-Feb. 10....Pittsburgh, Pa., Sixth Annual Show, Automobile Dealers' Association of Pittsburgh, Inc. Pleasure cars, first week. Commercial vehicles, second week.
- Jan. 29-Feb. 3.....Scranton, Pa., 13th Regiment Armory, Second Annual Show.
- Feb. 1-7.....Washington, D. C., Annual Show, Convention Hall.
- Feb. 3-10.....Montreal, Canada, National Show, Drill Hall, Automobile Club of Canada.
- Feb. 3-10.....Harrisburg, Pa., Third Annual Show, Arena.
- Feb. 5-10.....Buffalo, N. Y., Convention Hall, George C. Fehrman.
- Feb. 5-17.....St. Louis, Mo., Coliseum, Annual Show, Pleasure cars first week. Commercial vehicles, second week.
- Feb. 10-17.....Atlanta, Ga., Auditorium-Armory, Atlanta Automobile and Accessory Dealers' Association.
- Feb. 12-17.....Ottawa, Ont., Howick Hall, Annual Show, Ottawa Valley Motor Car Association.
- Feb. 12-17.....Kansas City, Mo., Annual Show, Combined Association of Motor Car Dealers.

- Feb. 12-17.....Troy, N. Y., Second Annual Show, State Armory, Troy Automobile Dealers.
- Feb. 12-19.....Dayton, O., Third Annual Show, Dayton Automobile Club.
- Feb. 14-17.....Grand Rapids, Mich., Third Annual Show.
- Feb. 17-24.....Pittsburgh, Pa., Second Annual Show, Exposition bldg., Pittsburgh Auto Show Association, Inc.
- Feb. 17-24.....Newark, N. J., Fifth Annual Automobile Show, New Jersey Automobile Exhibition Company, First Regiment Armory.
- Feb. 17-24.....Minneapolis, Minn., National Guard Armory and Coliseum, Annual Automobile Show, Minneapolis Automobile Show Association.
- Feb. 19-24.....Omaha, Neb., Seventh Annual Show, Auditorium, Omaha Automobile Show Association.
- Feb. 19-24.....Hartford, Conn., Annual Show, Automobile Club of Hartford, State Armory.
- Feb. 19-24.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
- Feb. 20-24.....Binghamton, N. Y., State Armory, Third Annual Show, Automobile Dealers' Association.
- Feb. 20-28.....Baltimore, Md., Annual Show, Baltimore Automobile Dealers' Association.
- Feb. 21-24.....Louisville, Ky., Fifth Annual Show, First Regiment Armory, Louisville Automobile Dealers' Association.
- Feb. 21-28.....Toronto, Ont., Annual Show, The Armouries, Toronto Automobile Trade Association.
- Feb. 24-March 2....Brooklyn, N. Y., Twenty-third Regiment Armory, Annual Show, Brooklyn Motor Vehicle Dealers' Association.
- Feb. 26-Mar. 2....Elmira, N. Y., Second Annual Show, Elmira Automobile Club.
- Feb. 26-Mar. 2....Paterson, N. J., Annual Show, Fifth Regt. Armory, Paterson Automobile Trade Association.
- Feb. 26-Mar. 3....Quincy, Ill., Highland Park Stone Pavilion, Annual Mississippi Valley Show, Quincy Auto Club.
- Feb. 28-Mar. 2....Davenport, Iowa, Annual Show, Davenport Automobile Association.
- March 2-9.....Boston, Mass., Tenth Annual Show, Boston Automobile Dealers' Association, Inc.
- March 4-9.....Denver, Col., Auditorium, Annual Show.
- March 4-9.....Denver, Col., Annual Show, Auditorium, Motor Field.
- March 6-9.....Tiffin, O., Second Annual Show, The Advertiser.
- March 12-16.....Syracuse, N. Y., Fourth Annual Show, State Armory, Syracuse Automobile Dealers' Association.

### Meetings, Etc.

- Jan. 8.....New York City, Waldorf-Astoria, Annual Meeting of the Motor and Accessory Manufacturers, Inc.
- Jan. 18-19.....New York City, Madison Square Garden, Annual Meeting Society Automobile Engineers.

## Republic Sustains Staggard Patent

ONE of the most important decisions ever reached in the department of automobiling with regard to tires was handed down Saturday by Judge Hazel of the United States Circuit Court in the suit of the Republic Rubber Company against Morgan & Wright. In a long opinion the court upholds the Republic company's contention that Morgan & Wright has infringed the Mell patent relating to anti-skid treads.

The court authorizes an injunction and accounting but does not tax the costs of the proceedings.

The next step in the litigation is for the attorneys for the complainant to frame a decree in accordance with the opinion of Judge Hazel and when such a decree is signed providing for injunction, hearings before one of the United States Commissioners may be held to determine the amount of damages.

On the other hand, the present status of the case may not be permanent, as the decision of the circuit court is not final. The case may be appealed after all the other means for obtaining a rehearing and review of the matter have been exhausted in the lower court. Then the case would go to the United States Circuit Court of Appeals, which, in all but a very small number of patent cases, is the court of last resort. The Supreme Court occasionally takes jurisdiction of an isolated patent case on writ of certiorari, but the probabilities are slight that such a case will ever reach that tribunal.

It was announced by the United States Tire Company, of which the Morgan & Wright company is a constituent part, that the case would be taken to the United States Circuit Court of Appeals in due course.

The interlocutory decree will be filed in the immediate future, probably this week, and it is quite likely that further action against other tire-makers will be started.

The matter has been in the hands of Judge Hazel since October 17 and its filing just before the abolishment of the United States Circuit Court came as a big surprise to motordom generally.

It is probable that the matter cannot be fully adjudicated within a year.

The full text of the decision follows:

IN THE CIRCUIT COURT OF THE UNITED STATES,  
SOUTHERN DISTRICT OF NEW YORK:

REPUBLIC RUBBER COMPANY VS.  
MORGAN & WRIGHT.

HAZEL, J.

This, an action in equity charging infringement by defendant of Letters Patent 898,907, issued to Tod J. Mell, Sept. 15, 1908, for improvement of pneumatic rubber tires for vehicle wheels. The patent refers to the tread surface of pneumatic rubber tires, which may be used on single tires or on tires having inflatable tubes. The object of patentee was to give the tire a superior road gripping quality, to reduce to a minimum the side skidding tendencies under varying load and road conditions, and also to make it durable and puncture-proof. The bill also avers infringement of the trade mark "Staggard" and unfair competition, in support of which allegations evidence is contained in the record; but such allegations of claim 3 have been dropped and complainant rests his case upon the alleged infringement of claim 1 only, which reads: "A tire for vehicle wheels provided with outwardly projecting, circumferentially arranged, elongated studs, each having inwardly diverging walls, a flat outer surface and a relatively large base, substantially as described." The claim is fairly descriptive of studs on the periphery of the tire in that they are (1) outwardly projecting, (2) circumferentially arranged, (3)

elongated (4) with inwardly diverging walls, (5) a flat outward surface, (6) a relatively large base.

The studs are moulded integral with the body of the tire and placed in series around its surface. They have rounded ends with flat outward surfaces and divergent side walls and they break joints with the adjacent studs. They are arranged in zig-zag form across the tread surface of the tire. The specification says the spaces between adjacent studs are "outwardly diverging—the better to clear the structure from mud and foreign matter that otherwise might accumulate and be compressed between said studs thereby impairing their usefulness as anti-skidding contrivances." It is evident that said tire is intended for use on automobiles as distinguished from bicycles and motor-cycles, though the patent contains no limitations. The defendant contends that the patent is invalid; or if valid, that it must be limited to exclude defendant's tire from its scope and generally denies infringement. Many prior patents for bicycle tires are in evidence, and defendant claims that by such patents and publications it is shown that studs or projections on the outer surface of the tire, substantially similar in construction and appearance to complainant's tire, and which operated in the same way, were old at the date of the invention; and that by applying ordinary skill the patentee simply changed their appearance and dimensions slightly to strengthen them so as to adapt them to the use of the automobile.

It must be conceded that in view of the prior art, the claim in suit is not broad and any rights to equivalents are correspondingly meager; but, nevertheless, I think the alterations made in the studs are not without patentable merit. In strengthening them and imparting to them distinctive characteristics the patentee has appreciably lessened the danger of forward and side skidding in automobiles. Users of high-power automobiles quickly recognized such characteristics and the advantages derived from their use, as is evidenced by the popular approval, by the larger sales, and by the displacement of other tires and devices used for similar purposes. This is an important factor bearing on the question of patentability. *Krementz vs. Cottle*, 148 U. S. 556. This is a case in which it is not easy to decide that the patent in litigation is invalid or anticipated by antecedent art. Although utility is not an absolute test of validity (*McClain vs. Ortmyer*, 141 U. S. 419) it must nevertheless be considered in this case in the determination of the question. The sudden dangers from side skidding of automobiles on wet or muddy roads was something to be feared and dreaded. Dealers in tires made early and repeated efforts to minimize this evil. Their efforts in this direction continued for 10 years unabated. It is shown that there have been many attempts in recent years prior to the patent in suit to adapt bicycle tires having anti-skidding studs or corrugations to automobiles to reduce the tendency to skid, and that such efforts failed to achieve the desired success. In testifying to the merits a number of witnesses have sworn that the Mell tire is more efficient in preventing skidding on different kinds of muddy or dry pavements and roads than any other tire known to the trade; that experience with former kinds and styles of non-skid has demonstrated that they are only efficient for a few hundred miles, while the efficiency of the Mell tire extends to 2,500 or 3,000.

To anticipate the patent the defendant relies on the expired Healy British patent, 20,544, and United States patent to Bailey, 588,724, dated August 24, 1897, for bicycle tires. The Healy tire concededly has never been used as an automobile tire save that the witness Mell tested it and used it experimentally before he conceived his invention. There is a resemblance between it and the complainant's tire, but the differences in the configuration of the studs on the periphery of the tire, though slight, are sub-

stantial. In the Healy structure there are three rows of elongated studs or ridges on the surface of the tire arranged longitudinally, each row breaking joints, as in the complainant's tire, with those of the adjacent row. All the studs are of the same form and dimensions, but instead of being rectangular and flattened at the top, as are the complainant's, they are rounded with pointed ends. The distinguishing features, though few, are, I think, clearly defined.

Prior to the present invention the inventor made a rubber tire to correspond to the Healy drawing and specification, and enlarged it for use on an automobile. The proofs show that the tread proved unsatisfactory as an anti-skid device, in that the studs after a run of 200 miles had an eroded and warped appearance, indicating that they retained little resistance to side skidding. He then designed the elongated studs specified in the claim in controversy. In the Bailey patent is described a series of frustro conical teeth located on the surface of the tire, "the bases of which are preferably tangent to each other." The teeth are made to "flex and bend freely laterally" under the weight of the bicycle and rider. It is the defendant's contention that the Bailey tread as described has the essential features of the Mell invention and accordingly anticipates it. But I do not think so. It is true the Bailey studs or teeth at their top are flattened and a trifle elliptical and the side walls tapered to enlarge the base; yet they have not the elongation with rounded ends of the complainant's studs, and without that they are unable to get the necessary grip on the road or pavement to reduce the skidding movement of automobiles.

The gripping capacity of studs was the desideratum of the complainant's invention and this characteristic is absent in the Healy and Bailey patents. Other antecedent patents in evidence claimed to anticipate have been examined by me and it is not believed that they have material relevancy. In the main their tread surfaces were inefficient to prevent the side skidding because the studs possessed straight side walls and angular edges instead of divergent and rounded. It is true that a wide departure in the configuration of the studs from the prior art has not been made, and the solution by the patentee of the problem before him perhaps was not fraught with greatest difficulty; but, nevertheless, that improvement was made, by the exercise of inventive faculty, in tires of this class is satisfactorily proven. That some of the elements of claim 1 are old and found in one or more prior rubber tires is unimportant in view of the fact that such elements have never before been assembled in the same way and caused to co-act so as to produce a new and useful result. The objection by the defendant that patentee aggregated old elements is without force as in their combination he caused them to perform something more than their special functions—he combined such elements to perform a new, useful and valuable result. The defendant contends that if there is a patentable feature it resides in the method by which the base of the studs is widened and in the fillet which co-operates to prevent elasticity of the studs, and as such features are not specifically included in the claim they cannot be added thereto. It is true enough that the patentee must be bound by the terms of his claims and can claim nothing which is not fairly embraced within its language; but such features are parts of the specifications and are thought to be mere details contributing to the manner in which the base is enlarged and the studs strengthened.

Aside from this, the combination of elements specified in the claim is descriptive of the invention and, of course, it was necessary to include the structural details. But to read the fillet into the claim, if it were necessary to do so to save the patent from invalidity, would not, it is thought, do violence to the patent law, although it would be different if the purpose were to read something into the claim not contained therein by reasonable construction, to avoid anticipation or escape infringement.

The defendant also contends that to elongate the studs, to round the ends and taper the walls were obvious things to do, and did not involve the exercise of inventive thought, but, as heretofore indicated, I am convinced to the contrary. The great

weight and speed of automobiles prevented using anti-skid tires specially designed for bicycles and ordinary vehicles. The problem presented to dealers in tires for automobiles was not one which the manufacturer of bicycle tires, with the prior art before him, could have solved and the alterations and modifications made by Mell were due to his inventive skill.

The defendant further contends that its tire is essentially different from the complainant's and that no confusion as between the two results to the trade.

To the eye, it is true, the tires look different; nevertheless, the studded treads of complainant's tire are appropriated by the defendants whose studs are alike in appearance, style and dimensions. They are arranged in rows around the outer surface and are longer than their width and rounded at the ends, with their tops flattened and their sides tapered, with enlarged bases. They are arranged obliquely, differing in that respect from complainant's; they extend around the periphery of the tire and by such use and configuration substantially the same result is achieved. The oblique arrangement, though perhaps more efficient, does not avoid the claim. Nor is it avoided by the use of a tread like that of the Heinemann British patent 2,260, as such use also embodies the specific elements of the claim which is the substance of the controversy.

Such being the conclusion reached, it follows that claim 1 of the patent in suit is valid and infringed by defendant.

Complainant may have a decree for injunction and an accounting, but without costs.

### Chauffeur Defined Under Callan Law

NEW YORK CITY, Jan. 2.—The question of what constitutes a chauffeur is one that has bothered automobilists ever since the Callan law went into effect nearly 2 years ago. Recently a shipping clerk for one of the automobile companies was arrested for driving a car without a license. When brought before the magistrate he was released on the ground that it was not necessary for him to have a chauffeur's license, as he was not a chauffeur. Charles Thaddeus Terry, who practically framed the Callan law, states that the provision of the statute is that the term chauffeur shall mean any person operating or driving a motor vehicle as an employee, or for hire. It is to be borne in mind that no one other than the chauffeur, as so defined, is obliged to have an operating license. As so defined, the chauffeur is one who is paid wages or compensation for operating an automobile; it does not include one who is paid wages as a bookkeeper or as a salesman or as a mechanic, who, on some rare occasion, is induced to drop his regular employment in order to drive a motor vehicle on some particular errand. Such a person is paid his wages or compensation for keeping books or for acting as mechanic or for performing services as a salesman and does not "operate a motor vehicle for hire," in the language of the statute. In other words, if a man is paid for operating a motor vehicle he is a chauffeur and must be licensed. If he is hired and paid for doing something else, and operates an automobile only occasionally and as a matter of kindness or courtesy, or out of an obliging disposition for his employer, he does not require a chauffeur's license because he does not come within the definition provided by the statute.

### Rehearing Denied for Battery Case

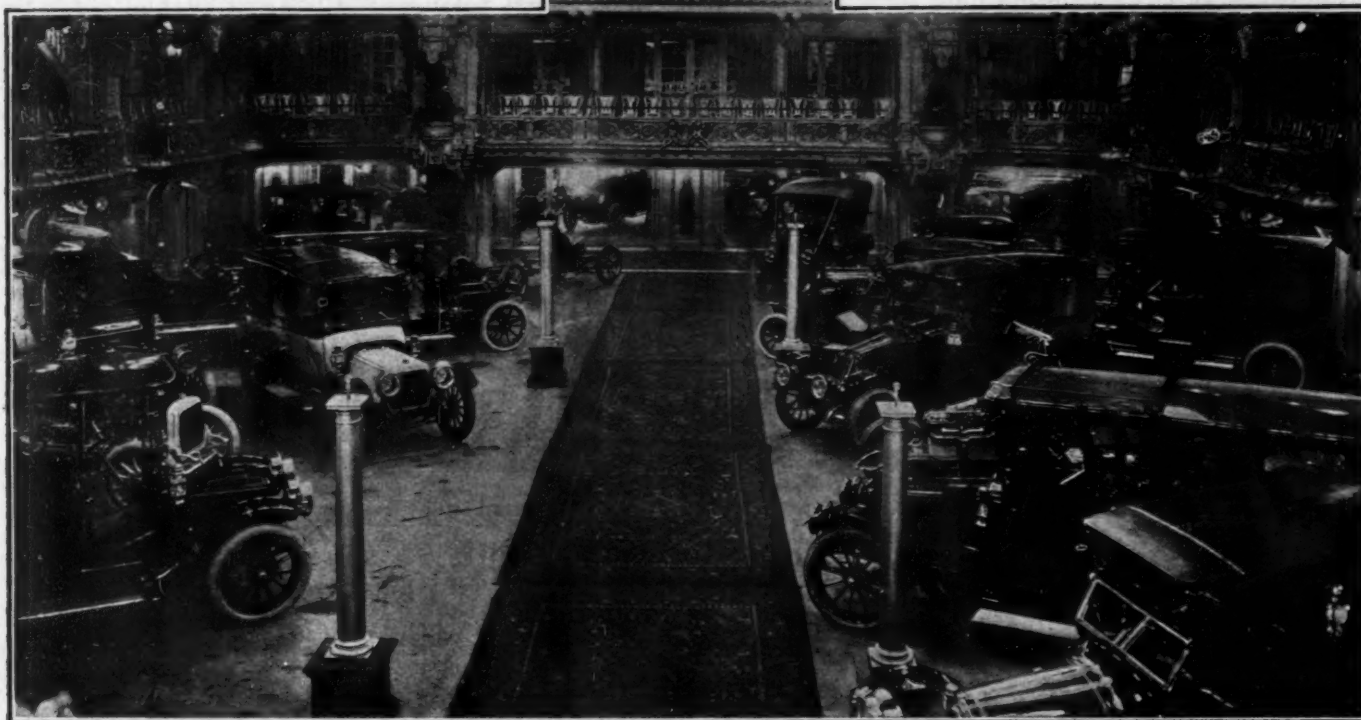
When the motion on the part of the Gould Storage Battery Company for a rehearing of its suit against the Electric Storage Battery Company was denied by the United States Circuit Court of Appeals last week, the litigation involving the machine used to manufacture lead plates came to an end as far as that court is concerned.

Despite the fact that the subject matter of the suit is a patent, as outlined in THE AUTOMOBILE recently, it may be possible to carry the case to the Supreme Court as the matter at issue is the conveyance of the patent rather than the patent itself.

# Importers' Salon



# Opens Show Season



General view of the Importers' Salon, showing the exhibits in the alcoves under the galleries

**B**EAUTY of design and embellishment is the keynote of the Importers' Automobile Salon, which opened at the Hotel Astor on Tuesday. The grand ballroom of the hotel, which is decorated throughout in gold, has been tastefully arranged, the cars being distributed about the sides of the room, while in the center a clear space has been left free in which visitors may promenade and inspect the cars. There are two balconies which are also open to the spectators who may wish to secure a general view of the exhibits.

The cars have also been distributed about the alcoves which surround the ballroom so that all the available space has been taken up without the slightest appearance of crowding. Many ladies have already taken advantage of the exhibit to inspect the newest types of cars and the magnificent upholstery and fittings of the town cars prove to be of great interest to the fair visitors.

Business prospects for the show are good. Those attracted to an exhibition of this nature are generally people of discriminating taste who have the intention of purchasing where their tastes are met by some product of the engine or body-builder's art. Interest was especially displayed in the new types of valves and in the valveless motors which have been exhibited abroad for some time, but which have been first exhibited to the American public at this Salon.

The exhibitors at the Salon, with the names of the cars they are showing, follow: Benz Auto Import Company, Benz; Ducas & Company, Darracq, Charron; Paul Lacroix Automobile Company, Renault, Daimler, Itala, Zedel, Clement-Bayard; De Dion Bouton American branch, De Dion; F. I. A. T. Company, Fiat; J. M. Quinby & Company, Isotta-Fraschini; Mercedes Auto Import Company, Mercedes; Metallurgique Motor Company, Metallurgique; Minerva Motors Company, Minerva; Napier Automobile Company, Napier; Panhard & Levassor, Panhard;

Piccard-Pictet, Pic-Pic; Renault Freres, Renault; T. E. Adams Company, Lancia, S. P. A.

One car which attracted special attention is an enclosed body of a pronounced colonial style mounted on a 60-horsepower Metallurgique chassis. In size and design it looks for all the world as though it had been taken from one of the old state coaches in which our Presidents in the early days of the Republic rode through the streets of Washington on their way to their inauguration. Colonial styles have been carried out in every detail, including lamps and tool box. The interior of inlaid San Domingo mahogany and white hollywood produces a very rich effect.

The highest powered chassis at the Salon is an Isotta-Fraschini which is rated at 100-120 horsepower and is said to be the highest-powered stock car in the world. It has six brakes, one on each road wheel and two on the jack shaft, the latter being water-cooled. A novel feature on this car is the double drop frame which makes it possible to swing the body low without reducing the clearance.

There are four different makes at the Salon which are showing cars driven by Silent-Knight motors. These are the English Daimler, Minerva, Panhard and Mercedes. In the last named a new oiling system has been incorporated which is receiving favorable comment. Rotary valve motors, which are entirely new in this country, are shown in the Darracq and Itala cars. The use of worm drives on the Minerva and English Daimler cars proved to be a real surprise, for no advance information regarding this feature had been given out by the exhibitors in question.

Following is a description of each of the exhibits in the Salon: **Benz**—Two chassis types of this make are on display at the Salon, but there are several of each size equipped with a

variety of body styles. The two chassis shown are the stock 30 and 50-horsepower cars. The big car is approximately 5 x 6 inches in its cylinder measurements and varies only slightly from the model of this size put out last year. It is equipped with tires 36 x 5 all around. On this chassis are fitted a Brewster limousine and a semi-closed body and a Quinby torpedo in royal coronation purple with gold stripings and gold-plated bright work. In the 30-horsepower chassis two bodies are shown, one a Brewster limousine and the other a Quinby limousine in the same startling color design as was used on the other Quinby body. Besides these cars a stripped and polished chassis of the 30-horsepower model is displayed.

**Charron**—The Charron exhibit consists of three models, a 30-horsepower landaulet, 22-horsepower limousine and a 15-horsepower town car. The first of these has an engine the cylinder measurements of which are 110 x 150 mm., or 4 5-16 x 5 7-8 inches. The second has a monoblock motor 3 3-4 x 5 1-8 inches and the smallest powered car also has a monoblock motor 3 5-32 x 4 3-4 inches. The two larger models have Bosch dual ignition and the town car chassis has Bosch magneto of the D. U. type. All the cars have the new carbureter adopted recently by the Charron company, and while chains are used in some of the large models, the drive system of the show automobiles is by cardan shaft.

**Clement-Bayard**—Two low-powered six-cylinder chassis are shown of this make, one being rated at 15-20 horsepower and the other at 20-30 horsepower. The mechanical features are twin cylinders in one casting, automatic carbureter, radiator on dash, three-speed gearset and final drive by propeller shaft. Accessibility is emphasized in the construction of the Clement-Bayard cars.

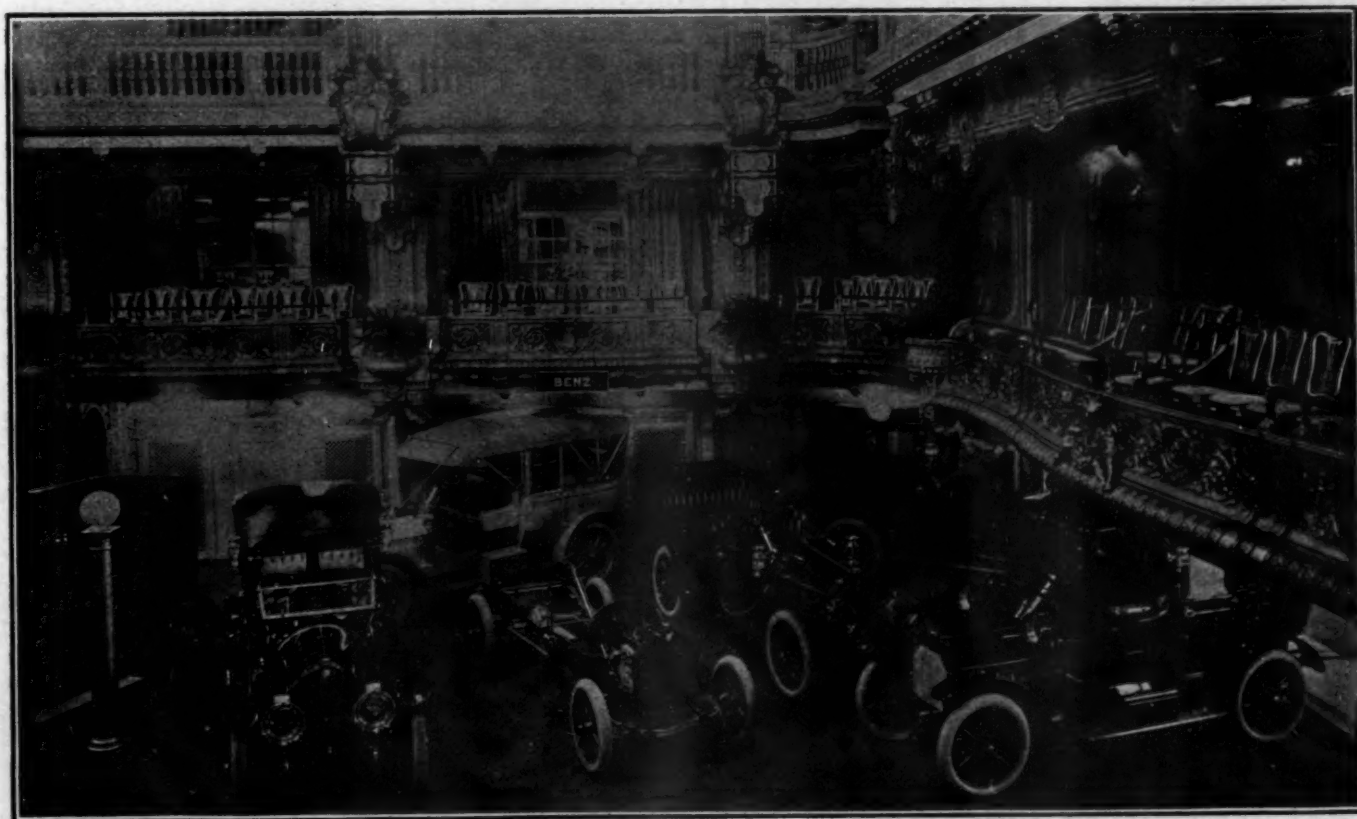
**Daimler**—Two chassis types are included in the Daimler Salon display. First is a six-cylinder Knight car fitted with a foredoor touring body. The engine of this car is rated at 38 horsepower, but develops considerable more power on the brake test. The other car is a 25-horsepower car with landaulet body. The lubrication system is the chief feature of this make aside from the fact that all its models are fitted with Knight engines.

This consists of the automatic device for varying the dip of the troughs to correspond with the opening and closing of the throttle. All Daimler cars are fitted with worm drive.

**Darracq**—Only one model of this make is shown at the Salon. It is a 16-25-horsepower car equipped with the Henriad rotating-sleeve motor which has caused something of a sensation in France this year. The Henriad principle differs materially from the Knight idea. The cylindrical distributing sleeve is placed on the side of the cylinders, somewhat below the top of the piston stroke to avoid the excessive heat that has proved an obstacle in other engines of the rotating type. The sleeve is actuated by half-time gearing from the crankshaft. It does not come into actual contact with the surface of the casing and is carried at each end by ball bearings. The rear axle contains a new feature in that the old level gears have been supplanted by a worm drive. The water pump and fan have been abandoned.

**De Dion Bouton**—One of the largest exhibits at the Salon is the display of this make of automobiles. There are eight models displayed, either as complete cars or as stripped chassis. The largest car shown is one equipped with an eight-cylinder motor 120 x 130 mm., rated at 100 horsepower. The wheelbase is 142 inches. A 30-horsepower chassis of the eight-cylinder type and one equipped with an inside drive landaulet body; a 40-horsepower, four-cylinder touring car; a 20-horsepower touring car; a 20-horsepower limousine, and a chassis and five-passenger touring car of 10 horsepower each complete the exhibit. The body work on all the cars where bodies are shown is done in cloth and is somewhat more luxurious than that of last year's line.

**Fiat**—The Fiat display consists of two complete cars and two polished chassis. The cars are fitted with landaulet and limousine bodies and are rated at 20 horsepower, using the chassis described as 15 horsepower in Europe. There are no noteworthy mechanical changes in this type of chassis. The stripped cars are one six-cylinder 38 horsepower and one four-cylinder car of 55 horsepower. A two-stage carbureter with throttle and mixing chambers separate and a remodelling of the gate change



Looking across the grand ball room at the Hotel Astor, showing details of the palatial setting of the Importers' Salon

mechanism and side brake gear are features of the larger models.

**Isotta Fraschini**—Two distinct types are shown in this exhibit. The leader of the line is the giant 120-horsepower chassis. This car has an engine the cylinders of which measure 5.12 x 7.9 inches. A feature of this model is the fact that it has six brakes, two of which are on the front wheels and are operated by emergency lever; two on the jackshaft, water-cooled, and two on the driving wheels. The other chassis type is rated at 35 horsepower and has front wheel brakes in addition to those installed on the rear wheels. This engine is also of the long-stroke variety, the cylinders measuring 3.94 x 5.5 inches. One complete car is also on exhibition to show the latest things in body design. The wheelbase of the smaller car is 124 inches. The big car is chain driven.

**Itala**—Two artistic limousines are shown as the representatives of this line at the Salon. The first is fitted to a chassis rated at 18-24 horsepower and the second on one of 25-35 rating. The larger car has a new type of engine which has two rotating vertical valves of skeleton piston shape serving for the inlet and exhaust of the four cylinders. The valves are water-cooled and lubricated by pressure and rotate at quarter the speed of the engine. The cylinder measurements are 115 x 130 mm. A multiple disc clutch, four-speed transmission, propeller shaft with two universal joints and a bevel drive are among the other features.

**Lancia**—One polished chassis and one complete car equipped with a cabriolet body constitute the Lancia exhibit at the Salon. The car is nominally of 30 horsepower, but its monobloc motor has four cylinders that measure 100 x 130 mm. and it is said that it develops 50 horsepower on brake test at 1,800 revolutions. The chief difference between the 1912 and 1911 model is that the pump and magneto are operated by the same gearing and the pump is now situated outside the casing. Last year it was inclosed. The body shown was designed by Brewster and contains a number of refinements that are new this year.

**Mercedes**—One complete car, equipped with a 50-horsepower Knight engine and a Kellner body; two stripped chassis, one 90 horsepower and the other a shaft-driven 50-horsepower car and a cut-out Knight engine constitute the exhibit of Mercedes cars. The complete car has a sleeve motor with paired cylinders measuring 3 15-16 x 5 1-2 inches. Ignition is by high-tension magneto as against low tension in the model of corresponding size that is not fitted with the sleeve motor. The wheelbase is 122 1-2 inches. The 50-horsepower chassis shown has a motor 4 23-32 x 6 5-16 inches, with low-tension ignition and a coil spring clutch, whereas the Knight car is equipped with a cone clutch. The wheelbase is 135 inches. The big car's motor is 5 1-2 x 6 5-16 inches and its wheelbase is 138 7-8 inches.

**Metallurgique**—Ever since it was first introduced in America the Metallurgique has proved to be one of the sensations of the imported division, and this year at the Salon the display of this make is commensurate with the amount of comment that it has attracted. There are six cars and a stripped chassis on show. The cars are nominally rated at 20, 30, 40 and 60 horsepower, and all are equipped with the characteristic radiator that makes their identification so easy. The construction of the Metallurgique seems a trifle lighter this year. Special and stock body designs in variety are displayed, including one enclosed body designed for touring and equipped with a profusion of minor refinements and improvements.

**Minerva**—The full line of models made by the Minerva company, including the 16, 26 and 38-horsepower cars are displayed at the Salon. The trio is equipped with the Knight motor and all are four-cylinder engines. Bosch dual ignition with automatic advance. The two smaller cars are worm driven, while the big car drives from the cardan shaft. The two larger models are built in two wheelbase lengths each, depending on whether a landaulet body is to be used or not. The longer model in the 26-horsepower chassis is 131 inches, while the longer model of the 38 is 134 inches. Two remarkable body types of landaulets are shown.

**Napier**—The Napier exhibit consists first of a 15-horsepower model of four cylinders fitted with a double cabriolet body by Mulliner, fully enclosing the front seat; the top is collapsible and can be converted into an open touring car with a few simple movements; and second, of a 45-horsepower, six-cylinder car, fitted with a seven-passenger torpedo touring body with double windshields to protect both driver and passengers. Deeper and more tilted seats are a feature of both models and the doors are both higher and wider than in 1911. The Rudge-Whitworth wire wheels are shown again this year.

**Panhard**—Six unusual body designs fitted to the regular 30-horsepower Knight-engined chassis of Panhard & Levassor and one stripped chassis of the same type form the exhibit at the Panhard stand at the Salon. The engine is of four cylinders 100 x 140 mm. There have been no radical changes in the construction of the chassis and the only difference to be noted among those exhibited is in the length of wheelbase. In one type the wheelbase is 116 inches and in the other it is 124 inches. But in the bodies shown there are some notable differences. Three remarkable body styles are shown; one a full collapsible gunboat landaulet in yellow and black; one collapsible Berline by Kellner and a foredoor coupé by Labouette.

**Piccard-Pictet**—This make of automobile was recently introduced in America and is known by the name of Pic-Pic and is shown in two models at the Salon. The leader of the line is the 18-22-horsepower car which has four cylinders in pairs, lubrication by pump to the main bearings, water pump, Hel-Shaw clutch and two universal joints, one at each end of the propeller shaft. The 22-30 model has a sleeve-valve motor manufactured under the Argyll patent and similar to the type used by that company.

**Renault**—The display of Renault cars will be very complete, consisting of the following: Double Berline limousine by Kellner on the regular 30-40 chassis; special limousine by Labouette, finished in light green silk and mahogany, also on a 30-40 chassis; landaulet-limousine by Muhlbacher on same type of chassis; Kellner limousine in inlaid mahogany; coupé on a 12-16 chassis and three polished chassis showing the mechanical working of the 35-45, 18-24 and 30-40 models. In addition to the above, a complete 12-16 car, equipped with landaulet body and an 18-24 similarly fitted will be displayed. The Renault cars of 1912 differ only in minor details from foregoing types.

**S. P. A.**—A single example of this type of automobile is shown at the Salon. It is a chassis rated at 16-20 horsepower with four cylinders monoblock. The engine is enclosed with a flush plate and is mounted on the main frame. A throttle adjustment on the dash and an accelerator pedal take the place of the usual levers on the steering wheel. Forced lubrication by pump through the hollow crankshaft, pump circulation, four speeds with direct drive on high and inclosed propeller shaft are other features of this model.

**Zedel**—Another comparative stranger to American eyes is the Zedel, a car that has attained quite a vogue abroad. At the Salon two coupés are displayed. One of the improvements to be noted in this car is the work in the starting crank which allows the handle to engage with the end of the crankshaft without necessitating pushing it into engagement. The float chamber of the carburetor is placed low down, while the mixing chamber is located over the cylinder. The car is rated at 14 horsepower, but is said to develop over 20.

### Bicyclists Fix on Banquet Date

Modern and old time bicyclists, from the ranks of whom came a material portion of the present day automobile force, will hold a banquet during the metropolitan show season. The function will be staged at the Earlington, on January 10, and preparations are being made to receive a representative attendance. The Motorcycle Dealers' Association, United Cyclists and allied organizations and the National Association of Cycle Jobbers have affiliated to make the event a success.

## S.A.E.'s Show Season Activities

**A**T THE NEXT MEETING of the Metropolitan Section of the Society of Automobile Engineers Charles Y. Knight will present a paper on the history and development of the slide valve internal combustion engine.

The second report of the Sheet Metals Division of the Standards Committee has just been completed. The report is confined to non-ferrous, principally copper alloys for sheets, rods and tubes. The specifications are followed by notes for the use of engineers in calculations requiring approximate knowledge on tensile strength and elongation. The specifications include standard sheet brass, low brass, brazing brass, free cutting brass, commercial bronze, gilding metal, phosphor bronze, copper sheets and strips, brass rods for cold heading, free cutting brass rod, tin bronze.

The Society will hold its next national meeting at Madison Square Garden, January 18-20. On Monday, January 8, the Springs Division of the Standards Division of the Standards Committee of the Society of Automobile Engineers will hold a meeting at 1451 Broadway.

On the evening of Tuesday, January 9, members of the Society will visit the Automobile Club of America, at the invitation of the Entertainment Committee of the Club, to hear presented a paper by Professor F. R. Hutton, Chairman of the Technical Committee of the Club, on carbureters, and an address by Charles H. Manly on his hydraulic system of transmission for commercial motor cars.

On Wednesday, January 10, at 9 o'clock a. m., a special advisory committee will hold a meeting at the S. A. E. New York office to discuss the subject of electric lighting for automobiles. The committee has practically decided on standard voltage and bases for incandescent bulbs, and has under consideration the following subjects: Output in volts and amperes; speed at this output; size of battery to be used; size of lamps for headlights and other lights; distance from base to center of generation shaft; base dimensions of generator; sizes of wire; type of insulation; connectors for lamps.

The Council of the Society will meet at the office of the Society on Wednesday, January 10, at 2 o'clock p. m., and the Standards Committee will meet at the same place on Tuesday, January 16, at 10 o'clock a. m.

The nominating committee of the Society of Automobile Engineers has selected the following ticket for 1912: H. F. Donaldson, president; H. W. Alden and Harold L. Pope, vice-presidents; Hermann F. Cuntz, treasurer. Members of council: A. L. Riker, Charles B. Whittlesey, A. B. Cumner and Henry Souther. This ticket will be presented to the society at its annual session, January 18-20.

The 1912 annual S. A. E. dinner will be held on the evening of January 19, in the Belvedere Room of the Hotel Astor. The committee in charge is H. M. Swetland (chairman), Hermann F. Cuntz, Thomas J. Fay, Howard E. Coffin, F. J. Newman, Coker F. Clarkson, secretary. At this dinner, the most important social function of the automobile engineers' year, brevity of speech will rule. A short address of welcome to the incoming president of the Society and accounts of the first formal S. A. E. European visit will be made.

During the second week of the show at Madison Square Garden the Society will exhibit materials and parts demonstrating concretely the nature and extent of its standardization work. The following firms will furnish articles for the S. A. E. exhibit: Spicer Manufacturing Company; General Electric Company; J. N. Lapointe Company; Motch & Merryweather Machinery Company; B. F. Goodrich Company; Hartford Rubber

Works Company; Detroit Seamless Steel Tubes Company; Hobbs Mfg. Company (Lock Washer Department); Rajah Spark Plug Company; Champion Ignition Company; C. F. Splitdorf Company; R. E. Hardy Company; Bosch Magneto Company; Pittsfield Spark Coil Company; Clark Bros. Bolt Company; Hartford Machine Screw Company; Lamson & Sessions Company; Phineas Jones & Company; Archibald Wheel Company; Kelsey Wheel Company; Virginia & North Carolina Wheel Company; Crape & MacMahon; Schwarz Wheel Company; Henry Souther Engineering Company. Mr. Joseph A. Anglada will be in charge of the exhibit.

### Show Season Program

**T**HE program for New York's show season, so far as it has been formulated, is as follows:

January 2.—Opening of the Importers' Salon at the Hotel Astor.

January 3.—Presentation of the Glidden Trophy at Rector's.

January 6.—Opening of Twelfth Annual Automobile Show at Madison Square Garden under auspices of the Automobile Board of Trade.

January 8.—Meeting of directors of Automobile Board of Trade. Meeting of Springs Division, S. A. E. Standards Committee, at 9 a. m., headquarters.

January 9.—Annual meeting of the Automobile Board of Trade at headquarters. Meeting of the Executive Committee of the American Automobile Association at headquarters. Meeting of Executive Committee Motor and Accessories Manufacturers at 10 a. m. at headquarters. Meeting of directors Motor and Accessories Manufacturers at 11 a. m. (Banquet Committee follows directors' meeting.) Contest Committee N. A. A. M. meets at headquarters. Meeting and lecture S. A. E. at the Automobile Club of America. Meeting of Iron and Steel Division Standards Committee, S. A. E., at headquarters. Meeting of Miscellaneous Division, Standards Committee, S. A. E., at headquarters. Big Village Motor Boosters' dinner at Breslin, 11 p. m.

January 10.—Opening N. A. A. M. show at Grand Central Palace. Closing of Importers' Salon at Hotel Astor. Banquet of importers at Hotel Astor. Meeting of Touring Board of A. A. A. at headquarters. Meeting of Special Advisory Committee S. A. E. on Electric Lighting. Regular meeting S. A. E. Council at 10 a. m. Annual meeting M. and A. M. at Waldorf, 10:30 a. m.

January 11.—Annual banquet M. and A. M. at Waldorf, 7 p. m. Directors meeting N. A. A. M., 9 a. m. Annual meeting N. A. A. M., 10 a. m., headquarters. Meeting of Legislative Board A. A. A. at headquarters.

January 12.—Meeting of Good Roads Board, A. A. A., headquarters. Meeting of Metals Division S. A. E., Charles Y. Knight, chief speaker, Engineering Building. Meeting of directors M. and A. M., 11 a. m. at headquarters.

January 13.—Closing pleasure vehicle week at Madison Square Garden.

January 15.—Opening truck week at Madison Square Garden. Meeting of Finance Committee, M. and A. M., 10:30 a. m., headquarters.

January 16.—Meeting Standards Committee, S. A. E.

January 18-20.—Annual meeting S. A. E. at Madison Square Garden.

January 19.—Annual banquet S. A. E. at Hotel Astor, 7 p. m.

## Four Hundred Cars at Buffalo Show

**B**UFFALO, N. Y., Jan. 1.—Fully four hundred various models of motor cars and automobiles representing an aggregate total investment of one million dollars is the total outlay of the Tenth Annual Automobile Show which opened here in the Seventy-fourth Regiment Armory, Niagara and Connecticut streets, on Saturday evening, December 30, under the auspices of the Automobile Trade Association. The four hundred models are housed in the drill room of the Armory, which comprises 66,000 square feet of floor space and which is 23,000 feet larger in area than the Madison Square Garden in New York City. The drillroom in which the show is being held measures 310 feet in length and 240 feet in width, giving ample floor space for exhibition purposes. The show is the most complete and elaborate exhibition ever seen in Buffalo, every car exhibited being a 1912 model.

Through the main entryway to the vast drillroom extends the brilliantly lighted central aisle of the exhibition floor, flanked by uniform white, foliage-trimmed pillars bearing glittering golden standards, upon each of which is displayed the name of the make of car allotted to that space. Upon arms extending above each standard there are two powerful inverted incandescent lights throwing intense light upon the polished surfaces of the myriad automobiles artistically grouped by the exhibitors. There are two parallel aisles similarly treated extending down either side of the armory where accessories, commercial cars and kindred exhibits are grouped. There are three beautifully brilliant cross aisles in the drillroom beside those at the south and north end of the armory. Gilded standards also divide inner boundaries of the exhibition spaces. The great, vaulted, steel-trussed roof of the armory is artistically treated with green and red streamers and the floor of the exhibition space is carpeted in red. The decorative scheme was worked out by Albert Hutton, of Buffalo.

Close inspection of each 1912 model exhibited at the present show indicates that the dominant feature is the straight-line, fore-door idea. These in roadsters and touring cars are displayed in numerous makes. The 1912 runabouts are revelations. In cars carrying coupé tops wonderful designs are exhibited in colonial, plain and elaborate styles. The beautiful broughams and limousines of 1912 are in a class by themselves, having surpassed in design, construction, commodious appointments and artistic detail anything previously shown.

The list of exhibitors at the Buffalo show and the cars they have on exhibit are as follows: Abbott-Detroit, Pope-Hartford, and Stevens-Duryea, Co-Operative Motor Car Co., Buffalo; American, Babcock Electric, Winton, Ralph E. Brown Motor Co., Buffalo; Cadillac, Kane Motor Supply Co., Buffalo; Carter Car, Lewis Engel, Jr., Buffalo; Case, J. J. Case Threshing Machine Co., Syracuse, N. Y.; Chalmers, Hupmobile, Stearns, Mason B. Hatch Co., Buffalo; Columbia, Maxwell, United Motor Buffalo Co., Buffalo; Cole, Baker Bros. Motor Co., Buffalo; Denniston Commercial Car, E. E. Denniston Co., Buffalo; De Tamble, Matheson, Union 25, Matheson Automobile Sales Co., Buffalo; E-M-F, Studebaker Corporation, Buffalo; Everitt, Marathon, Paige-Detroit, Victor Trucks, Warren-Detroit, Poppenberg, Buffalo; Ford, Ford Motor Co., Buffalo; Franklin, George Ostendorf, Buffalo; Grabowsky, Buffalo Maintenance Co., Buffalo; Havers Six, Sanderson & Burghardt Co., Buffalo; Hudson 33, Barrett Motor Car Co., Buffalo; Hupp-Yeats Electric, R-C-H, Hupp Corporation, Buffalo; Kissel Kar, Buffalo Kissell Kar Co., Buffalo; Kline Kar, Windsor Motor Car Co., Buffalo; Knox, Pullman, Reo, Meyer Motor Car Co., Buffalo; Krit, Krit Motor Car Co., Buffalo; Marion, Harry L'Hon-medieu, Buffalo; McFarlan Six, Frontier Motor Car Co., Buf-

falo; Mitchell, John J. Gibson, Buffalo; National 40, Pathfinder, Zimmer Motor Vehicle Co., Buffalo; Oakland, Cantaur Motor Co., Buffalo; Overland, Overland Buffalo Co., Buffalo; Packard, Densmore Co., Buffalo; Peerless, Henry Brunn Auto Co., Buffalo; Pierce-Arrow, Pierce-Arrow Sales Co., Buffalo; Premier, White Gasoline, Lutz Auto Co., Buffalo; Rauch & Lang Electric, U. S. Auto Station, Buffalo; Stoddard-Dayton, J. A. Cramer, Buffalo; Thomas Six, E. R. Thomas Motor Car Co., Buffalo; Velie, Dixon Motor Car Co., Buffalo.

Many persons from surrounding cities are in attendance at the Buffalo show, including a delegation of prominent automobile dealers from Rochester, N. Y., who are getting pointers for the show to be held at Rochester January 22-27. A delegation of Syracuse automobile men is expected to attend the local show later in the week.

Because of the fact that many automobile manufacturers were unable to supply Buffalo dealers with 1912 show models in time for the show being held here this week, it has been decided to hold a second show in Convention Hall, February 5-10, under the direction of George C. Fehrman, who has already begun the allotment of space for exhibition purposes.

### Individual Efforts to Supplement Quaker Show

PHILADELPHIA, Dec. 30.—Individual displays at the showrooms of practically every company in the city will form an interesting feature of the local show season. Automobile Row, in North Broad street, is already putting on gala attire and will present a holiday appearance, as will the new automobile section on Market street west of Twenty-first street, and the many firms that are scattered indiscriminately over a wide area will make their headquarters showrooms for the display of models crowded out of the armories through lack of room.

Some firms, owing to inability to secure adequate display space at either of the armories, will be obliged to divide their lines, displaying a portion in their armory space the first half of the week and a portion in their private showrooms, transferring the latter to the armory for the last three days and removing the installed exhibit there to their showrooms, so that included in the category of individual displays will be included those firms that will be represented in either or both of the big armories as well.

Following an established precedent, the show committee of the Philadelphia Automobile Trade Association has designated Wednesday evening, January 17, as "society night."

### News of Other Local Shows

OMAHA, NEB., Jan. 1.—Plans are being pushed for the seventh annual automobile show of the Omaha Show Association to be held February 19 to 24.

There are thirty-two members in the association and seven have in applications for membership, so that thirty-nine companies will exhibit cars and accessories.

The commercial vehicle display will be larger than ever before, eight firms having already expressed their intention of displaying cars, and a number more are expected to do so.

ATLANTA, GA., Dec. 30.—Homer George, manager of the Atlanta Automobile Show, and his assistants are making progress with their plans for the exhibit and have already arranged for decorations, a band and for the billing of the territory.

## Independent Shows Will Flourish

UNDER the shadow of Madison Square Garden a small independent automobile show will be held at the same time that the show is going on at the Garden itself. The National Boat and Motor Company, which is located in a large store on the corner of Twenty-seventh street and Madison avenue, is busily engaged in renting space to dealers and manufacturers of automobiles and accessories who did not secure space at the Garden. The idea was conceived by this company after the success which attended the exhibit of motor boats during the recent Motor Boat Show at the Garden. Owing to the fact that no admission was charged as well as to the interesting exhibit of boats and accessories the place was continually crowded. The same result is expected during the automobile show. Two concerns have already contracted for space, namely, the Stewart Auto Company, of New York, and the Commercial Truck Company of America, whose headquarters are at Philadelphia. The former concern will exhibit two Mais truck chassis of  $2\frac{1}{2}$  tons capacity, one having a wheelbase of 130 inches and the other of 132 inches. The Stewart exhibit will also include their automobile school. The Commercial Truck Company exhibit will consist of the line of electric trucks made by this concern. Negotiations are proceeding with several other concerns for space in this building.

The Ford Motor Company, of this city, will hold an informal reception for Ford owners in this city during show time. The salesroom at 1723 Broadway will be decorated in greens and electric lights, while on the floor will be a working chassis model, a touring car, runabout, limousine and delivery wagon.

## Inventions Show to Be Held in April

NEW YORK CITY, Jan. 2—Great interest is now centered in the coming Inventions Show, scheduled to be held next April at the Grand Central Palace.

The idea of holding the show was conceived by John B. Farquhar, who has had success in promoting several large exhibitions of national importance, including the late Florida exposition. New York and Buffalo capitalists have joined in creating this wonderful exhibition and there promises to be found at the Palace, when the doors are open on April 13 next, the most interesting and instructive assemblage of labor-saving devices, inventions and modern mechanical appliances the world has ever witnessed.

The space reserved for the Government Loan Exhibit, which has proved of such absorbing interest to those who have seen it, is on the main floor of the building. By special act of Congress, foreign exhibits will be admitted free of duty, which fact in itself promises a fine collection of foreign inventions, which will have a chance to be compared with their American rivals. Offices have been opened in Ellicott square in Buffalo and at the Grand Central Palace in this city.

## New Automobile Law in Maine

AUGUSTA, ME., Jan. 2—The new motor law went into effect this week and the office of the Secretary of State has been a busy one for some weeks receiving applications for registrations. Under the new law the cars are divided into three classes and proportionate fees are charged according to horsepower as follows: Under 20 horsepower, \$5; from 20 to 35 horsepower, \$10; all above 35 horsepower, \$15. Motor trucks or cars used for commercial purposes are rated at \$10, and this includes traction engines or log haulers. Motorcycles are placed at \$3. Dealers in motorcycles pay \$6, and dealers and makers of motor cars or trucks pay \$25. It costs \$2 for a fee to operate a vehicle. Maine does better than her sister states in New England for instead of limiting non-residents to 10 days she allows them 30 days. The money will be used for road maintenance.

## Glidden Trophy Given to Maxwell

IN THE presence of about 150 automobile men, the Glidden Trophy was formally presented to the Maxwell-Briscoe Company Wednesday afternoon at an elaborate luncheon spread at the Hotel Rector. Besides the guests who were not connected with the United States Motor Company, those present included Benjamin Briscoe, Horace De Lisser, Alfred Reeves and other officers of the company and the drivers and crews of the winning team in the recent Glidden tour.

A. G. Batchelder, chairman of the executive committee of the A. A. A., presided as toastmaster. He introduced Charles J. Glidden, donor of the trophy, who referred briefly to the history of the trophy, its purposes to motordom, and conferred it upon Mr. Briscoe.

Mr. Briscoe in accepting the trophy traced the efforts of his company to win it during a period of seven years. He paid a graceful tribute to the team as a whole and concluded by saying that the automobile world owed Mr. Glidden a debt for his enterprise in fostering the spirit of progress.

Major John C. Wetmore completed the speaking program with a short talk on the tour itself.

Silent toasts were drunk to the memories of Samuel M. Butler and Joseph E. G. Ryan.

Among those present were many of the leaders of all the prominent national organizations of automobilists, including the Automobile Board of Trade, National Association of Automobile Manufacturers, Motor and Accessory Manufacturers, American Automobile Association, Society of Automobile Engineers and Automobile Club of America.

## Indianapolis Garages Overflowing

INDIANAPOLIS, IND., Jan. 2—With all of the present garages filled to capacity, there is immediate need for additional garages in Indianapolis. The provision for garaging in the last two years has not kept pace with the demand for such service and as a result many persons are being obliged to erect small, temporary garages at their homes.

During the early days of the motor car industry, every agency had a garage in connection. Increased rents and ground values, however, have resulted in many agencies occupying quarters only large enough for the display of a few cars and for office purposes.

Many of the garages that have been erected in the exclusive residence districts must enlarge or seek new quarters. Thus far, however, there has been no inclination to charge excessive prices for garage service. Prices at present are from \$10 to \$15 a month for runabouts; \$15 to \$20 a month for touring cars, and from \$25 to \$30 a month for electrics. Repair work ranges from 60 to 75 cents an hour.

One of the inducements for people to buy cars has been the steady reduction in the price of gasoline during the last year or two. At the present time it is possible to contract for gasoline at 9 1-2 cents a gallon from the oil companies, although a majority of the garages charge 15 cents a gallon.

## Joseph "Evergreen" Ryan Is Dead

Joseph E. G. Ryan, one of the best known publicity men connected with the automobile industry, died early Tuesday morning in his room in a Chicago hotel. Mr. Ryan had acted as publicity agent for various national automobile shows; served as presiding officer at numerous major social functions associated with the industry and for many years was identified with daily newspaper work.

He was about 47 years old, a native of Ireland, and had been a resident of the United States for twenty years. His death was probably due to heart disease.

## Optimism Reigns at Detroit

**D**ETROIT, MICH., Jan. 1.—Detroit motor car manufacturers and dealers are celebrating to-day the advent of what gives every promise of being the most prosperous year in the history of the industry.

Some idea of what the automobile has meant to Detroit in a commercial way the past year may be formed from the records of the Detroit Clearing House, which show bank clearings of \$968,647,059 for the year as against \$910,835,008 for 1910, an increase of \$57,812,051, or 6.34 per cent. The increase over 1909 was \$200,908,935. The motor car industry naturally is entitled to a large share of the credit for this excellent showing.

The feeling of optimism that exists as the new year dawns is not confined to any particular branch or line of the industry; it is general and is shared alike by the maker of the high-priced car and the maker of the low-priced car, by the truck manufacturer and by the producer of light delivery cars. Ask any of them. The answer will be the same in every case.

J. G. Bayerline, vice-president and general manager of the Warren Motor Car Co., says: "From the reports of our branch managers and our salesmen throughout the country, and from the report of our sales manager on his recent eastern trip, the outlook is for one of the best seasons in years."

In the factories the machines are humming merrily and the song that they sing is "Prosperity." In some quarters there seems to be a dearth of help, an unusual condition for mid-winter. The Wilson Body Co. is advertising for metal panellers and finishers. The Welch Motor Car Co. is seeking, through the local liner columns, first-class boring mill, milling machine, drill press and grinder hands. The Havers Motor Car Co., of Port Huron, is after the "best final assembler in Detroit."

Several Detroit companies are mapping out very extensive plans for the enlargement of their facilities. The Abbott Motor Company has taken an option on a large piece of acreage out Mack avenue, beyond the Lozier plant, and expects to build a large addition as soon as the weather will permit, or in the spring at the latest. The Federal Motor Truck Company, for the third time in eighteen months, has again found it necessary to increase its manufacturing facilities and is looking for a larger factory.

The General Motors Company begins the new year in its handsome new home at Congress and Brush streets, having started Saturday to vacate its old headquarters at 127 Woodward avenue, which it outgrew months ago. The company has leased five of the six floors of the Boyer-Campbell Building, just completed, and each of the floors contains almost as much floor space as the entire building now being vacated, the total area available being about 75,000 square feet. The various departments will be distributed as follows: Second floor, testing laboratory; third, production, engineering and purchasing departments; fourth, sales and publicity; fifth, accounting and statistical; sixth, executive offices.

With the opening of the Detroit show only three weeks away, Manager Walter Wilnot has his hands full. The decorations both in the Wayne pavilion and in the annex will be elaborate. One of the most conspicuous and attractive features will be an immense auto wheel, suspended from the ceiling in the center of the main hall, from the center of which festoons of light will depend to all parts of the floor. The walls will be covered with a filmy drapery with borders of breech-leaves and smilax. The floors throughout will be covered with green burlap.

T. W. Henderson, son of vice-president Thomas Henderson, of the Winton Motor Car Company, who has been manager of the Michigan selling branch of the Winton for the past 5

years, has resigned to engage in the manufacture of motorcycles here. He has organized the Henderson Motorcycle Company, with a capital stock of \$175,000.

L. W. Taylor has been placed in charge of sales for the state of Michigan by the Krit Motor Car Company, and will have his offices in the local sales rooms at 465-467 Woodward avenue.

### J. I. Case Company Reorganized

RACINE, WIS., Jan. 2.—Although details of the reorganization are not yet completed, it is authoritatively announced that the J. I. Case Threshing Machine Company, of Racine, will increase its capital stock from \$5,000,000 to \$40,000,000, one-half being 7 per cent. preferred and the other half common stock. The name will be the J. I. Case Company and its line of products, which includes Case motor cars, will be greatly extended to cover the entire harvesting and farm machinery plant. To carry out this plan the Case Company will close negotiations at once for the absorption of several large plants specializing in various types of such machinery. These connections will enable the company to place on the market a line of commercial vehicles or motor trucks in addition to Case pleasure cars. The company has a selling organization that covers the entire face of the globe, with branches in all important cities in America and the capitals of all foreign countries. Since entering the motor car field, its product, the Case car, has gained a foothold in practically every country on earth. The officers of the company are: President, Frank K. Bull; Richard Robinson, vice-president; Frederick Robinson, secretary, and F. Lee Norton, treasurer.

### Streator Company Outlines Its Plans

STREATOR, ILL., Dec. 29.—The Streator Motor Car Company, which builds the Halladay car, is out with a statement outlining its plans for the future. The statement in part is as follows: "This company filed a voluntary petition in bankruptcy last September, not for the purpose of being adjudicated bankrupts, but simply to enable Messrs. Barlow and Chubbuck, its principal stockholders, to offer to its creditors a composition of 100 cents on the dollar.

"These gentlemen have come forward and put up over a million dollars' worth of outside property against which they have issued bonds which have in turn been given to the creditors of the Streator Motor Car Company. Of about 180 creditors only two of them are raising any objections to accepting the bonds, and as the law only requires a majority in number and amount the composition will no doubt be approved by the court next week when it comes up for final adjudication.

"This procedure will leave this company with about \$750,000 of assets and no liabilities and the result will be the putting of the company on its feet financially."

### Palmer Resigns from Cartercar Company

PONTIAC, MICH., Jan. 2.—R. A. Palmer has resigned as general manager of the Cartercar Company, of this city. Mr. Palmer will remain in Pontiac and will devote his attention to the Franklin Provident and Savings system, recently established here. No successor to Mr. Palmer has been announced, but for the present his work will be divided between factory manager C. A. Trask and sales manager Harry B. Radford. Mr. Palmer was one of the organizers of the Cartercar Company.

## Late General and Trade News

**M**EXICO CITY, MEX., Jan. 2.—Much interest was shown by local automobile enthusiasts as well as by those of Puebla in the third annual El Emparcial-El Automobile Mexico-Puebla race that was run between this city and Puebla recently, a distance of about 135 miles by the road. The starters numbered 14, in the three classes, A, B, C. The official starter was Juan Perez, and he succeeded admirably in getting the cars away promptly from San Lazaro, the starting point. The first car to get away was a Lozier racer, No. 1, driven by Harry Schutz. Up to the time this car reached a point about two miles this side of Texico it was doing finely. It suddenly swerved into the ditch, but was again brought back into the road apparently unharmed. The engine then went back on Schutz. An inspection showed that going into the ditch had damaged it too much to continue the race and it was brought back to the city. Car No. 3, driven by Harry Ham, was put out of the running by engine trouble.

Of the fourteen starters but eight finished. The names of the cars, their drivers and the time of their arrival in Puebla follow:

Itala (Eladio Campero), 11:24:42; Protos (Ubaldo Basini), 11:49:49; Stevens (Domingo Costabile), 12:11:07; Buick (Rafael Gonzalez), 12:26:09; Buick (Marcario Perez), 12:15:55; Lancia (Cesar Ghiglini), 12:55:55; Delahaye (Juan Berutto), 12:58:31; Protos (R. Pinchetti), 1:10:36.

The best time was made by the Protos car, driven by Basini, and it was awarded the cup.

A distressing feature of the race was a fatal accident which occurred near the little town of Calpulalpam. A car of spectators, including Jorge Fernandez, a noted civil engineer, Mrs. Mercedes Sayago de Fernandez, Alfonso and Alberto Cardenas and a chauffeur, was on its way to Puebla early in the morning when it swerved from a bridge, turned turtle and instantly killed Mr. Fernandez and Alfonso and Alberto Cardenas. Mrs. Fernandez was also seriously injured.

### Forty in French Grand Prix and Voiturette

According to cable advices, the French Grand Prix race, which will be held in June, has been boycotted by all the German makers, an agreement having been framed among the German companies not to race. The Fiat also will not take part, although a car of this make won last year's event. It is thought likely that the British manufacturers will make a strong effort to lift the cup. The sole American representative in the field is the Ford. There are more than forty entries in the Grand Prix and light car races, and so the section of the rules providing for keeping open the entry box until March 1 in case a minimum number of thirty had entered by December 30 may be applied.

### Hoosiers Find Trucks Better than Horses

INDIANAPOLIS, IND., Jan. 2.—In March, 1911, the Board of Public Works of Indianapolis bought two one-cylinder gasoline trucks for the field corps of the city engineering department. Henry W. Klausmann, city engineer, says that the two trucks have performed the work of three horse-drawn vehicles, thus saving not only the expense of an additional vehicle and its maintenance, but the salary of an additional corps of men as well. Mr. Klausmann says that the actual cost of operating the two trucks since March 1, including gasoline and all repairs, has been \$12.50 a month each. The city is now paying \$20 a month per head for feeding horses at livery stables. It is probable that the remaining three corps of the engineering depart-

ment will be given motor vehicles in the spring. The Indianapolis Board of Public Safety will soon ask bids for a combination hose and chemical wagon to cost not to exceed \$5,500 and for a touring car to be used for emergency runs by the police and to cost not to exceed \$5,000.

### Growing Need for Uniform Traffic Regulation

NEW YORK CITY, Jan. 2.—There are many evidences in different parts of the country of a sentiment in favor of general uniformity in traffic regulations. The greater attention that is being paid to this important question in all of the large cities has exerted a direct influence upon all communities where traffic has attained any reasonable proportions. In many cities and villages where traffic has largely increased in recent years, due to the more frequent use of the automobile, this demand for proper regulation is taking the form of requiring suitable lights to be displayed on all vehicles after sundown, while, in more thickly populated centers, decisive action is being taken against the muffler cutout on motor vehicles.

### Mais Truck Company Increases Capital

INDIANAPOLIS, IND., Jan. 1.—In order to meet its present financial needs, the Mais Motor Truck Company has increased its capitalization \$75,000. It is expected that this move on the part of the company will result in the early dismissal of the suit for receiver brought by Harry S. Bloch, of Wheeling, W. Va., some time ago.

Bloch brought suit on the ground that the company was insolvent and that it had lost an option on certain property because it had been unable to meet a required payment of \$5,000 on the option.

Stockholders of the company agreed to take \$75,000 worth of additional stock.

### Metzger Continues 1-Ton Truck

Although the Metzger Motor Car Company has resold to the Hewitt Motor Company, of New York, a large share of its truck business, it is said that a popular unit of the line—namely the 1-ton truck—will still be manufactured in Detroit by the Metzger concern, hereafter being known as the Everitt truck.

In speaking of this matter last week, W. E. Metzger said: "Manufacturing operations on these 1-ton trucks have already been begun, and the new models will be ready for delivery in the early spring. Their distribution will be effected through the list of over 400 dealers now handling the Everitt line."

### Truck Club's Election Date

On account of the approach of the metropolitan show season the Motor Truck Club has carried over the date for its annual election to January 4. The election will be held at the Automobile Club of America and the following ticket has been named by the nominating committee: O. C. Fenner, president; Emerson Brooks, vice-president; Charles E. Stone, secretary and treasurer. Board of Managers: E. B. Porter, E. Lascaris, E. O. Koopemgarner, A. N. Bingham, E. J. Curtis, Jr., A. J. Slade and J. N. Kennard.



Baker trucks used by Halle Brothers' Cleveland department store

**CLEVELAND, O.**—Halle Brothers, the well-known merchants, have recently installed a battery of electric trucks for light delivery service. They were built by the Baker Motor Vehicle Company of this city and are handsomely designed. The installation was made after a thorough trial of electric trucks during the past few years had demonstrated their efficiency for the purpose. The old-fashioned models were then disposed of and modern Bakers purchased in their stead.

**FREDERICK, MD.**—The Ideal Garage Company has awarded the contract to erect a garage to Roy W. Poole.

**MONTREAL, QUE.**—The St. Louis Automobile Garage has been appointed local agent for the Cutting car.

**GREENVILLE, O.**—The Central Auto Company, of this city, has taken the agency for the Stoddard-Dayton line for 1912.

**KANSAS CITY, MO.**—J. H. Van Closter will erect a garage of reinforced concrete at 207-9-11 West Fourteenth street.

**GRAND RAPIDS, MICH.**—The Westcott car is being introduced to the local trade through the Grand Rapids Auto Company.

**MT. VERNON, O.**—Walter Lake has leased the old gas house on South Mulberry street and will open a modern garage and repair shop.

**ROANOKE, VA.**—The Virginia Motor Car Company is building a garage on Jefferson street which will cost \$15,000. R. A. Figgatt has been awarded the contract.

**TORONTO, ONT.**—The sale of Ohio cars in Canada will be controlled in future by the American Motor Sales Company, a new concern which has been incorporated in this city.

**SEAFORTH, ONT.**—The Northern Motor, Limited, of this city, represents the Paige-Detroit in Canada and has placed agencies for this car in the leading cities of the Dominion.

**LIMA, O.**—The Gramm Motor Truck Company, of this city, has established a depot in New York, where a garage and service station will be operated for its motor trucks.

**INDIANAPOLIS, IND.**—Alfred W. Markham has resigned the position of treasurer of the Mais Motor Truck Company. His place is being filled temporarily by Hiram Moore, assistant treasurer.

**WHEELING, W. VA.**—A state automobile paper, to be the official organ of the Ohio Valley Automobile Club and the West Virginia State Automobile Association, will make its initial appearance early in the spring.

**COVINGTON, O.**—A new automobile business, comprising a garage and repair shop, will soon be established here. The promoters are W. R. Allen and Paul Bethel, of this city, and Paul H. Hesser, of Cincinnati, O.

**SANDWICH, ONT.**—Incorporation has been granted the Ford Motor Company, with capital of \$1,000,000, and head office in this city. The incorporators are: Henry Ford, of Detroit; W. L. McGregor, of Windsor, and others.

**SASKATOON, SASK.**—A new automobile concern with strong financial backing has just been formed here under the name of the Standard Auto & Supply Company. This new firm has secured the agency for Northern Saskatchewan for the E-M-F 30 and the Flanders 20.

**BOSTON, MASS.**—Charles Addison Malley, who formed the Malley Motor Car Company to handle the Warren and the Flanders electric, has sold out his interest in the agency and has accepted a position as Eastern district manager of the King Motor Car Company, of Detroit.

**RICHMOND, VA.**—The 1912 state automobile number plates in Virginia are olive green. Secretary of the Commonwealth B. O. James has been issuing licenses at a rate of 200 a day. In most instances the purchasers of 1912 tags retained the same number as they had during 1911.

**WINDSOR, ONT.**—Letters of incorporation have been granted to the Canadian Two-in-One Auto Company, which was recently organized here. The company is capitalized at \$200,000, and the following are the provisional directors: Messrs. S. Cole, G. A. Smith, F. E. Bowen, A. R. Bartlet and F. A. Hovey.

**LIMA, O.**—Arrangements are being made by the automobile dealers of this city to hold an automobile show in the Auditorium some time in February, the date to be fixed later. A temporary organization was formed as follows: Oliver DeWeese, president, and Cliff Counsellor, secretary-treasurer.

**MONTREAL, QUE.**—A petition of certiorari against the Court of Records was presented in the Superior Court recently by L. Boyer, K. C., for the Auto-Taxi Car Company. Last week the company was sentenced by the Recorder to pay the usual carter fee for each of its cars and it now appeals that decision on the ground that the provincial license includes the right of carrying passengers, which is denied by the city.

ROME, GA.—John R. Jones has purchased the Rome Motor Car Company from A. R. Sullivan.

FAIRMOUNT, W. VA.—The Newcomer Motor Car Company has moved into its new garage at Fairmont avenue and Fifth street.

BOSTON, MASS.—Frank Crockett, formerly with the Knox and more recently with the Locomobile company, has joined the Boston branch of the Fiat.

JEFFERSON, WIS.—The Waverly Motor Company has commenced operations in its new plant here and the first motors will be marketed about February 1.

DETROIT, MICH.—The plant of the Universal Motor Truck Company has been purchased by interests headed by Howard Walton, of New York City. Plans are under way for the enlargement of the plant.

BOSTON, MASS.—Winslow H. Chadwick, New England manager of the Empire Rubber Company's branch, has moved his salesroom from Devonshire street to 119 Summer street, where he has much larger salesrooms.

MILWAUKEE, WIS.—The Ideal Motor Car Company, of Indianapolis, Ind., manufacturing Stutz cars, has gained representation in Wisconsin by the establishment of the Stutz Motor Car Company of Wisconsin in this city.

WASHINGTON, D. C.—The Hudson agency has been transferred from H. B. Leary, Jr., to C. S. Storm. The latter has opened a salesroom at 1006 Fourteenth street, N. W., under the name of the Hudson Sales Agency.

MILWAUKEE, WIS.—A holiday banquet was tendered to the heads of departments, superintendents and stockholders of the Federal Rubber Manufacturing Company by the officials in the Hotel Pfister. Byron C. Dowse, president, acted as toastmaster.

BOSTON, MASS.—W. H. Stevens, for several years with the Park Square automobile station, and later with the Stoddard-Dayton agency, has taken the agency for the National here. He has secured temporary quarters in the Autocar building on Beacon street.

MILWAUKEE, WIS.—The estate of Albert Smith has formed a corporation under the name of Albert Smith, Inc., to continue the business of the late Albert Smith, 169-175 West Water street, for many years state agent for the Palmer-Singer. H. F. Boggis will be manager.

PHILADELPHIA.—Frederick G. Mott, Jr., has severed his connection with the commercial vehicle department of the Longstreth Motor Car Company, 257-259 North Broad street, local agents of the Alco line, of which he was the manager, and has been succeeded by Francis Von A. Cabeen, Jr.

DETROIT, MICH.—R. C. Hupp has brought out the S.S. line of models of the R. C. H. car. The new models are equipped with self-starter, dual ignition, demountable and quick detachable rims, gas tank, extra rim and the other usual accessories. The motor is of the long-stroke type with valves inclosed.

AKRON, O.—H. F. Marenville, of the H. F. M. Manufacturing Company, has obtained a patent on a new oiling system adapted for use on automobiles and launches. In connection with the filtration system the invention includes a specially designed engine-base which must be used in connection with the system.

COLUMBUS, O.—Upon the application of the Hearne Tire & Rubber Company, of Columbus, O., N. J. Ruggles has been named receiver for the Capital Supply & Manufacturing Company, of 24 East Town street. The defendant company, which handles automobile supplies of all kinds, admits insolvency. Outstanding obligations are said to amount to \$3,000.

BOSTON, MASS.—C. F. Whitney and C. H. Barney have formed a partnership as the Whitney-Barney Company and they have taken the agency for the Selden and Lion cars and the Gramm trucks for eastern Massachusetts. Salesrooms have been opened on Boylston street, where the Matheson was formerly handled before it moved to Commonwealth avenue.

LANSING, MICH.—The National Coil Company has moved into its new quarters on North Cedar street, occupied by the Ideal Motor Company until the building was gutted by fire last spring. The rebuilt plant was made especially to accommodate the coil company, which has grown remarkably since its organization in 1903. The company manufactures magneto spark-coils and plugs.

DALLAS, TEX.—A new Cole distributing point has been established here under the name of the Southwestern Cole Motor Company. The new concern will have a

large slice of Texas, Oklahoma and Arkansas territory. The officers of the company are: W. F. Bridwell, president; W. Y. Foster, vice-president; C. B. Foster, secretary and treasurer, and C. F. Hurst, general manager.

MILWAUKEE, WIS.—The Flanders Automobile Company, of Detroit, Mich., manufacturing the Flanders electric, has opened a Wisconsin branch in Milwaukee and has arranged with the Kopmeier Motor Car Company, 375-89 Summit avenue, operating the largest electric car garage and service station in the Northwest, to act as Flanders service department for Wisconsin for a long term of years.

PHILADELPHIA.—The annual election of the Century Motor Club, Broad and Oxford streets, will be held early in January of the new year. Candidates for the various offices have been nominated as follows: President, J. Frederick Hartman; vice-president, Frank Isaac and Harvey Uhler; treasurer, J. W. Beyer, J. H. Clarke, Levi W. Moore, Morris Naylor and C. B. Sears; secretary, C. D. Holden.

COLUMBUS, O.—The Big Four Railroad Company is considering the advisability of competing with the electric lines in various parts of Ohio by operating a gasoline car service on short stretches of its track. Two gasoline cars, it is argued, could be operated more cheaply and with better service than steam trains. Managers of the company have sent several of its officials to Detroit to watch the operation of gasoline cars on the Ann Arbor line.

WILMINGTON, DEL.—The congested condition of the mails prior to Christmas prompted the local postoffice authorities to try the use of an autocar in making mail collections. Assistant Postmaster Leroy W. Hickman accompanied the car on its 42½ miles of collection territory. The complete round was made each time in 6 hours and 27 minutes, in which time 278 boxes were tapped and four trips were made to the main postoffice.



R. C. Hupp in the 1912 R. C. H. touring car



New Home of the American-Marion Sales Company

MINNEAPOLIS, MINN.—W. A. Crowe & Sons, 1027 Hennepin avenue, have taken the Union line.

CLEVELAND, OHIO—The Park Motor Car Company, of 10,217 Superior avenue, this city, has taken the agency for the Metz car.

MINNEAPOLIS, MINN.—The Regal Sales Company, Inc., with \$25,000 capital, has been organized to succeed the Regal Sales Company.

MINNEAPOLIS, MINN.—The John P. Snyder Company has taken state rights in Minnesota for the Lexington. The company is about to open a new garage. It handles the Fiat.

ST. PAUL, MINN.—The Foster-Lawrence Company has the St. Paul agency for the Detroit Electric and has accepted plans for a new garage, Grand avenue between Grotto and Avon streets.

DENVER, COL.—C. F. Cole, the head of the Cole Motor Car Company, has made arrangements for erecting a new sales and service department building. He expects to take possession March 1.

MINNEAPOLIS, MINN.—R. A. Briggs, formerly Northwestern sales manager for the Studebaker Minneapolis branch, has associated himself with the St. Paul Motor Vehicle Company, local agent for the Studebaker line.

NEW YORK CITY—G. Pierce, a former Associated Press man, has joined the forces of the Colt-Stratton Company, 2000 Broadway, Eastern distributor of the Cole car. Mr. Pierce will have charge of the firm's promotion department.

DALLAS, TEX.—The Munger Automobile Company is to erect a large garage on Commerce street which will cost \$28,500. The building is to be three stories in height and will have a steel frame. Lang & Mitchell have prepared the plans.

NEW YORK CITY—Cowans Brothers, late of England, have adopted a new method of utilizing old tires. They combine two old tires into one reclaimed tire. The cost of the process is small and it is claimed that the reclaimed tires give excellent service.

BOSTON, MASS.—Ralph Coburn, for the past six years with the local branch of the Maxwell-Briscoe Company, has been promoted to the position of manager of the branch of the Stoddard Dayton Company. Mr. Coburn was sales manager of the Maxwell branch.

MINNEAPOLIS, MINN.—W. V. B. Campbell, of the Northern Motor Sales Company, has taken the Minnesota territory for Marion cars. Mr. Campbell has the Lozier agency and has removed to the former Parker garage at 45 Tenth street South, Minneapolis.

MINNEAPOLIS, MINN.—The Hudson & Thurber Company, who have distributing rights for the Speedwell, have consolidated the automobile department with the Donnell-Wickers Company, distributor for the Bergdoll, with headquarters in the Northern Motor Sales Company garage.

CHICAGO, ILL.—The Chicago Automobile Trade Association has passed a resolution binding its members to enforce cash payment for repairs after January 15. No favoritism is to be shown and customers will be required to pay for all repairs or work done when the car is taken from the shop.

PITTSBURGH, PA.—H. B. Frye, Jr., has resigned his position as manager of the Standard Automobile Company, of this city, and will go into the steel business, in which he was formerly engaged. He will be succeeded by W. P. Berrien, formerly president and general manager of the Stoddard-Dayton Automobile Company, of Philadelphia.

CANTON, OHIO—Articles of incorporation have been filed with the Secretary of State increasing the capital stock of the Imperial Rubber Company from \$50,000 to \$300,000 and reorganizing the company under the name of the Imperial-Gordon Rubber Company. The reorganization and the increase in the capital stock mean the expenditure of several thousands of dollars in extensions and improvements at the plant.

SYRACUSE, N. Y.—Collection of mail by automobile was tried for the first time in Syracuse recently, and twelve sacks of mail matter were brought to the post office in less than an hour from the several stations. It would have taken four wagons all the evening to render the same service. The experiment was tried to aid in the Christmas rush, and eventually it is expected that the automobile mail carrier plan will be adopted here exclusively.

NEW YORK CITY—Before sailing for home at the end of his recent visit to this country, Lancia, the former Italian automobile race driver, arranged for a new American selling agency to handle the car which bears his name. This is the T. E. Adams Company, in which two pioneers in the imported car business, T. E. Adams and E. Lillie, are associated. Headquarters have been opened at 235 West Fifty-eighth street.

INDIANAPOLIS, IND.—The following agents have been appointed by the Cole Motor Car Company, of this city: M. H. Hayn, Savannah, Ga.; R. P. White, Youngstown, Ohio; D. E. Sunderland, Freeport, Ill.; W. R. Holloway, Collins, Miss.; R. McCoy, Ulrich, Mo.; V. Vernon, Syracuse, N. Y.; in California, F. W. Decker, Red Bluff; E. C. Smitton, Sacramento; Novelty Garage, Stockton; E. B. Gilbert, Watsonville; J. A. Spates, Dixon; G. Rummel, Geyserville; W. Yerxa, Colusa, and E. A. Levreau, San Bernardino.

**HASTINGS, MICH.**—The Hastings Motor Shaft Company has increased its capital from \$50,000 to \$75,000.

**MINNEAPOLIS, MINN.**—The Yale Automobile Company, 318 Fifth avenue South, has taken the Northwestern agency for the Penn Motor Car Company, of Pittsburgh, which makes the Penn car.

**CLEVELAND, O.**—The Sharp Spark Plug Company, of this city, has increased its capital stock from \$10,000 to \$20,000. J. F. Johnson is president.

**MINNEAPOLIS, MINN.**—The Chase Motor Truck Sales Company has just taken the agency of the Chase Motor Truck Company, of Syracuse, N. Y. This new agency's territory includes the entire state of Minnesota, also North and South Dakota and a small portion of Wisconsin.

**JACKSON, MICH.**—On October 23, 1911, Roy Baker and Ben Haehnle, two young men of this city, left in a Jackson 50 tour-about with the intention of reaching Los Angeles by the way of Chicago, Ill.; Kansas City, Mo.; Oklahoma City, Okla.; Dallas, Texas; El Paso, Texas; Tucson, Ariz.; Yuma Indian Reservation, Cal. In order to pay the expenses of the trip they established agencies along the line for the American Oil Company's products and adjusted matters along their route for the Jackson Automobile Company.

**SASKATOON, SASK.**—If any proof were needed of the popularity and the growing demand for the automobile in the West it would be found in the figures recently published for the Province of Saskatchewan, which show that in the neighborhood of 1,400 automobile licenses have been issued in the province. Of these about 600 are held in the four cities of Saskatoon, Regina, Moose Jaw and Prince Albert. Moose Jaw heads the list with 236. The remainder of the number are scattered at various points throughout the province.

**BOSTON, MASS.**—J. Sumner Draper and Mark Temple Dowling have purchased a tract of land on Beacon street, at the junction of Brookline avenue, comprising 72,000 feet, upon which will be erected a big structure for motor concerns. It will have a frontage of 540 feet on Beacon street and 150 feet on Brookline avenue. The structure will be three stories and sub-divided so that each unit will be about 34 feet wide and so arranged that one or more may be used by a firm. The salesrooms and service departments will be housed together, and to facilitate getting into the repair departments inclined planes will run from the street directly to the second floor.

**LANSING, MICH.**—Since the Michigan highway department was established, July 1, 1905, there have been built in this state with the aid of the state reward 850 miles of good roads. This is, according to a statement made by Highway Commissioner H. T. Ely to Governor Osborn. On this

mileage there has been paid in state rewards \$585,290. Of the total mileage constructed, 514 miles were gravel road and 313 miles macadam. There are 600 miles in course of construction, or just completed on which rewards are pending. During the

year ending June 30, 1911, there were 304 miles constructed, of which 216 miles were gravel road, the form of highway construction which seems to be most popular in this state, and on which the state has paid \$193,876 in rewards.

## Automobile Incorporations

### AUTOMOBILES AND PARTS

**BROOKLYN, N. Y.**—Central Motor Co.; capital, \$10,000; to manufacture automobiles, motors, machinery, etc. Incorporators: R. Dubecq, A. M. Beres, W. H. Baradell.

**CHICAGO, ILL.**—Commercial Car Sales & Service Co.; capital, \$10,000; to manufacture automobiles, motors and accessories. Incorporators:—G. H. Taylor, B. McWilliams, F. A. Kinchart.

**NEW YORK CITY.**—National Rim Co.; capital, \$150,000; to manufacture automobile parts and accessories. Incorporators: L. J. Fleming, J. J. Hafner, E. N. Brandt.

**CHICAGO, ILL.**—Federal Truck Co.; capital, \$10,000; to manufacture automobiles, trucks, etc. Incorporators: C. W. Rhodes, D. F. Rosenthal, L. S. Rosenthal.

**SAVANNAH, GA.**—Motor Vehicle Co.; capital, \$200,000; to manufacture automobiles, vehicles, etc. Incorporators: S. Myers, S. Stewart, W. A. Collins and others.

**CANTON, OHIO.**—Imperial-Gordon Rubber Co.; capital, \$300,000; reorganization of Imperial Rubber Co.; to make automobile tires and other rubber goods. Incorporators: C. W. Keplinger, C. J. Keplinger, A. E. Gordon, E. Currant.

**PORTLAND, ME.**—Merrill & Higgins Motor Co.; capital, \$5,000; to manufacture, sell and deal in all kinds of motors and all articles connected therewith. Incorporator: F. S. Higgins.

**NEW YORK CITY.**—Hewitt Motor Co.; capital, \$1,000,000; to manufacture and deal in automobiles. Incorporators: A. Ames, R. E. Henley, J. O. Wingrave.

**HAMMONDSPORT, N. Y.**—Curtiss Motor Co.; capital, \$600,000; to manufacture motors, aeroplanes, etc. Incorporators: M. Wheeler, J. S. Fanciulli, G. R. Hall.

**NEW YORK CITY.**—American Elastic Wheel Co.; capital, \$50,000; to manufacture automobile wheels, etc. Incorporators: C. Feroci, A. D. Walsh, F. Corsi.

**EVANSVILLE, IND.**—Columbia Taxicab Co.; capital, \$10,000; to operate transfer cabs. Incorporators: H. E. Hulsman, W. Wheeler, A. C. Mathias, E. C. Kinkle.

**WORCESTER, MASS.**—White Motor Car Co.; capital, \$15,000; to deal in automobiles. Incorporators: H. I. Cashman, P. McHale, T. F. Manion.

**DETROIT, MICH.**—Nichwals Co.; capital, \$100,000; to manufacture automobile parts and accessories. Incorporators: H. W. Nichwals, T. A. Nichwals, H. Lau.

**BOSTON, MASS.**—Whitney-Barry Co.; capital, \$100,000; to deal in automobiles. Incorporators: C. F. Whitney, C. H. Barry.

**PITTSBURGH, PA.**—Pittsburg Motor Truck Co.; capital, \$5,000; to deal in motor trucks. Incorporators: W. C. Jacob, J. J. Cosgrove, J. L. McKnight.

**WILMINGTON, DEL.**—Williams Steel Wheel Rim & Tire Co.; capital, \$1,000,000; to manufacture automobile parts and accessories. Incorporators: W. E. Williams and others.

**NORTHAMPTON, PA.**—Siegfried Motor Co.; capital, \$10,000; to manufacture all kinds of motors. Incorporators: C. A. Porter, J. J. Kocher, J. Warta, B. R. Debbie.

**ATLANTIC CITY, N. J.**—C. V. Stahl Motor Co.; capital, \$5,000; to manufacture all kinds of motors. Incorporators: C. B. Stahl, C. T. Moyer.

**CAMDEN, N. J.**—Penn Motor Car Co.; capital, \$500,000; to manufacture automobiles. Incorporators: V. A. Murray, L. A. Meyers, D. Beltinger.

**COLUMBUS, O.**—E. M. F. & Flanders Sales Co.; capital, \$10,000; to operate a sales agency. Incorporators: G. E. Thomas, H. H. Kellenberger, A. C. Secrest, D. Thomas, F. Rubrecht.

**RICHMOND, VA.**—Roanoke Motor Car Co.; capital, \$5,000 to \$25,000; to operate a motor car company. Incorporators: F. Welch, Sr.; J. E. Shickle.

### AUTOMOBILE GARAGES AND ACCESSORIES

**CHICAGO, ILL.**—Lee Motor Co.; capital, \$50,000; to manufacture automobile accessories. Incorporators: C. A. Johnson, O. J. Lee, R. C. Henderson.

**CLEVELAND, O.**—Koepe Motor Sales Co.; capital, \$30,000; to deal in automobiles and operate a garage and repair department. Incorporators: J. C. Koepe, E. C. Hansel, H. B. Brownlee, E. G. Derr, E. Koepe.

**GREENSBORO, N. C.**—Ford Garage & Sales Co.; capital, \$10,000; to deal in automobiles and operate a garage. Incorporators: R. L. Markham, W. H. McGlamery, W. M. Combes.

**BUFFALO, N. Y.**—Frontier Motor Car Co.; capital, \$5,000; to deal in automobiles. Incorporators: E. Harris, W. Graham, V. L. Hagstrom.

**DETROIT, MICH.**—New Era Motor & Manufacturing Co.; capital, \$50,000; to manufacture automobile supplies. Incorporators: W. R. Smith, G. Gilmore, J. Scheidegger.

**CHICAGO, ILL.**—National Spring Time Co.; capital, \$125,000; to manufacture automobile accessories. Incorporators: C. D. Sigman, L. Valence, C. H. Jackson.

**ST. LOUIS, MO.**—Electric Garage & Service Co.; capital, \$2,000; to deal in electric automobiles and automobile supplies. Incorporators: M. B. Strauss, C. Irvin, B. Strauss.

**CHICAGO, ILL.**—Devon Garage; capital, \$2,000; to operate a garage. Incorporators: R. E. Beaubien, W. J. Burns, J. E. Hurtubise.

**CAMDEN, N. J.**—League of American Motorists Co.; capital, \$10,000; to good automobile legislation, good roads, &c. Incorporators: S. G. Garry, H. N. Goldsmith, F. Voigt.

**NEW YORK CITY.**—National Rim Co.; capital, \$150,000; to manufacture automobile parts and accessories. Incorporators: L. G. Fleming, J. J. Hefner, E. N. Brandt.

**HUNTINGTON, N. Y.**—Motor Repair Co.; capital, \$5,000; to operate a garage. Incorporators: R. W. Lindsay, R. E. Nebel, K. C. Bates.



Jackson Mudhen which recently made the trip from the factory to the Pacific Coast

# OF INTEREST *to the* INDUSTRY



Alco 3 1/2-ton truck which recently completed a 144-hour service test

**PHILADELPHIA**—A 3 1/2-ton Alco truck recently made a remarkable showing in continuous service here for the Adams Express Company. During 144 hours of night and day duty the truck hauled 451,500 pounds of merchandise in 93 loads. It made 814 collections and deliveries. A valuation of approximately \$300,000 was represented in the 12,104 parcels, boxes and barrels delivered. The total cost of fuel consumed was \$15.14. Of this \$11.68 was for gasoline and \$3.46 for oil. A total of 589 miles was covered, an average of 98 miles a day.

**NASHVILLE, TENN.**—The Tennessee Auto Company plans to erect a \$3,000 repair shop on Grundy street. The company will install a full machine equipment.

**KIEL, WIS.**—The Kiel Motor Car Company, organized by Fred Theisse, Philip Juenheimer and William Ducker, will erect an automobile factory here.

**HARTFORD, CONN.**—The Henry & Wright Manufacturing Company, of this city, has acquired the plant of the Parker Motor Company, 760 Windsor avenue.

**DETROIT, MICH.**—Knell & Adams, automobile body finishers, have purchased the plant of the Stoepel Overall Company, 1045 Jefferson avenue, and will equip it for their own use.

**ST. LOUIS, MO.**—The Moon Motor Car Company, of this city, has begun the construction of another story to its factory building and will equip it for almost doubling its capacity.

**BUFFALO, N. Y.**—Manzel Brothers Company, of this city, manufacturer of automobile oil-pumps, etc., is building a brick factory one and one-half stories in height on Babcock street.

**PITTSBURGH, PA.**—The Atlantic Land Company, of this city, has taken out a permit to erect a \$70,000 garage on Craig avenue. The Atlantic Land Company is the new owner of Luna Park and proposes to make the park an automobile center.

**AKRON, OHIO**—The Miller Rubber Company, which manufactures Miller tires and tubes, has increased its capital stock from \$500,000 to \$1,000,000. The reason for this increase was the necessity for increasing the company's plant to twice its present size to take care of the increasing business.

**FLINT, MICH.**—The Randolph Motor Car Company has been sold by the General Motors Company to Eugene G. Goldman, of Chicago, who formerly owned it. The purchase by Goldman will not affect the location of the plant and it is said that the output of motor trucks will be increased.

**FINDLAY, O.**—Negotiations are in progress for the establishment of a new automobile factory in this city. Ludwig Leitner and M. Weiting, two Findlay men, have patented a new chainless-drive motor truck and arrangements are being made to organize a corporation to manufacture the new vehicle.

**JACKSON, MICH.**—The Sparks-Withington Company, manufacturer of automobile parts, is rapidly bringing its new addition to completion. It will furnish employment to 300 additional men. The complete plant, when the addition is done, will be one of the best equipped and most beautiful shops of its kind in the world.

**LOS ANGELES, CAL.**—The Amalgamated Motors Company, of this city, recently incorporated with a capital of \$500,000, has acquired the Durocar Manufacturing Com-

pany. The company has obtained a site near Santa Ana, Cal., and is planning the erection of a large plant for the manufacture of pleasure cars and motor trucks.

**MILWAUKEE, WIS.**—H. B. Webb and associates in the Franklin Auto & Supply Company, Fourth and Prairie streets, have incorporated the Automatic Motor Devices Company, to manufacture several self-starting devices. The incorporators are H. B. Webb, C. H. Delafield and James T. Drought. One of the starters to be placed on the market is operated with a distributor-timer.

**JEANETTE, PA.**—The factory building of the American Rubber & Fabric Company is about finished and the machines are being installed. The company expects to take up the manufacture of tires about the beginning of April; it will make the Zeglen tire, the fabric of which is made up of cotton and rubber to give punctureproof casings. Wilmer Dunbar is named as general manager of the works.

**COLUMBUS, O.**—F. W. Dickinson, who some time ago incorporated the Automotor Company with \$50,000 capital stock, has leased a plant at 1181 Parsons avenue and the following officers have been elected: F. W. Dickinson, president; William Caskey, vice-president; Frank Lodeman, treasurer; A. F. Dickinson, secretary. The company proposes manufacturing an extremely light delivery wagon.

**MILWAUKEE, WIS.**—The Auto Starter Company has been incorporated here by J. D. Babcock, Oscar F. Fishedick and James T. Drought to manufacture a self-starter to be known as the E-Z Self-Starter. The E-Z starter is a simplification of self-starters based on the principle of forcing gas from a lighting gas tank into the cylinders, and operates with a simple pedal not unlike an accelerator.

**NEW YORK CITY.**—The A. V. Manufacturing Company, recently incorporated with \$200,000 capital stock, has had plans prepared for a one-story fireproof factory building, 60 by 100 feet, to be erected on a site recently purchased at Poughkeepsie, N. Y. The company is having a list prepared for its machinery requirements for the manufacture of motor specialties. The incorporators are Allesandro Bolognesi, Aldo Bolognesi and William H. Hoppin, Jr.

**SYRACUSE, N. Y.**—The Chase Motor Truck Company has completed its large three-story addition in Wyoming street. The construction and equipment is remarkably complete and embodies the most advanced ideas. Some 18,000 square feet of floor space are now added to the former facilities of the company.

# PATENTS GONE TO ISSUE

**INTERNAL COMBUSTION ENGINES**—In which the charge is fired by the hot residues in the cylinders.

2. This patent refers to a two-stroke, internal combustion engine (Fig. 3), having a working cylinder and piston in which the charge is ignited by the heat of the recompressed residual gases and in which the maximum pressure in the cylinder does not exceed the pressure of the incoming gas. The engine has an admission valve which also serves as a mixer, the mixture of air and fuel being effected at the point of junction of the admission circuit and cylinder. The flame extends from the valve into the cylinder on the working stroke during the entire period of admission, and the exhaust valve which is provided closes before the end of the scavenging stroke of the working piston. Means are provided to control the compression pressure of the recompressed residual gases, and means to ignite the initial charge upon starting the engine.

No. 1,101,769—To Adolf Vogt, Tulse Hill, Surrey, England. Granted December 26, 1911; filed May 18, 1906.

**WINDSHIELD**.—Combination of two panels flexibly attached to a frame.

3. This windshield (Fig. 2) comprises a suitable sill or base to which a lower panel is hinged being adapted to swing forwardly. An upper panel is hinged to the lower one and is adapted to swing backwardly with reference to the same. Guide rods are located at the ends of both panels, the rods having vertically adjustable clamping devices which are pivotally connected with the ends of the upper panel.

No. 1,012,670—to Allen Loomis, assignor to Packard Motor Car Company, Detroit, Mich. Granted December 26, 1911; filed October 15, 1907.

**CARBURETER**.—Which has two mixing chambers and a number of auxiliary air valves.

3. This patent refers to a carbureter (Fig. 1) which is a combination, with a casing, of an air supply tube which extends concentrically within the casing mentioned. At the upper end of the tube a plate is supported which forms the top of a combustible fluid chamber, and above the plate, within the casing, a partition is supported through which extends, and from which depends, a nozzle communicating with the fluid-supply chamber. This nozzle extends within the last-mentioned tube. In the partition a number of valve-controlling air ports are provided, and there are means for the successive opening of the air valves with the increasing speed of the engine crankshaft.

No. 1,013,082—to Robert Symmonds, Jr., assignor to Thomas B. Jeffery, Kenosha, Wis. Granted December 26, 1911; filed August 2, 1906.

**DRILL CHUCK**.—Device for holding drill in place on machine.

3. This patent refers to a drill comprising a shank on which a rotatable shell is mounted and which is connected to the shank by means of a spring. Within the shell there is a housing and on the end of the same a plate is mounted rotatably, it being formed with inwardly curved slotted

openings. At the opposite end of the housing a plate is secured which carries inwardly slidable guides, and a number of rollers are supported to opposite ends in the slots and guides respectively. There is provided a rotatable plate having inwardly directed straight slots receiving the adjacent ends of the rollers mentioned, this plate being connected with the shell to force the rollers inwardly as the shell is rotated upon the shank.

No. 1,012,731—to Charles Sjostrand, St. Paul, Minn. Granted December 26, 1911; filed June 30, 1911.

**ENGINE STARTER**.—In which a coiled spring and a cranking pulley serve for starting the motor by means of a pedal.

1. In this starter, an engine shaft carries a clutch member and a cranking pulley movable on the shaft and constituting another clutch member. The pulley has a collar and by a coiled spring is connected to the engine frame. A flexible member is wrapped around the pulley, and means are provided for moving the latter longitudinally on the engine shaft; also, means comprising a dog which is mounted stationarily on a part of the structure and to which is connected a spring arm adapted to bear against the face of the collar carried by the cranking pulley mentioned above. The spring arm is adapted to bring the dog into engagement with the collar for automatically separating the clutch members if the direction of rotation of the engine shaft is reversed.

No. 1,007,170—to Henry Wurmser, Lorain, O. Granted October 31, 1911; filed March 28, 1910.

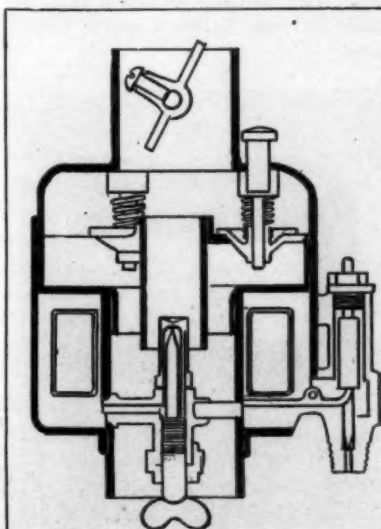


Fig. 1—Symmonds carbureter.

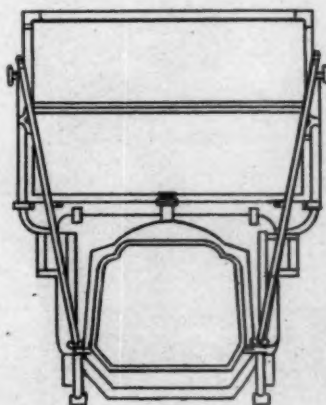


Fig. 2—Loomis windshield.

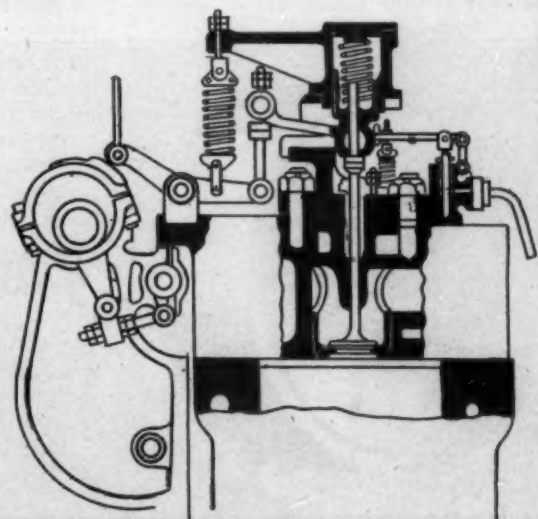


Fig. 3—Vogt engine

## Newest Ideas Among the Accessories

### Hyatt Roller Bearings

THE Standard type of Hyatt roller bearings is seen in Fig. 1, showing the long spiral or flexible roll, which is used in axle construction. Each roller consists of a spindle around which is wound a chrome-nickel steel spiral whose material in-

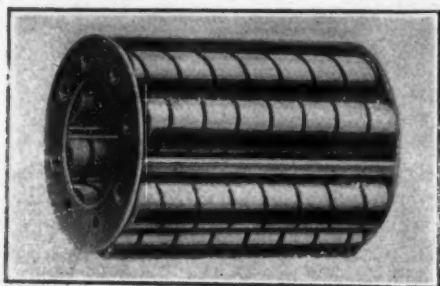


Fig. 1—Standard type Hyatt bushing

sure strength and resistance against all kinds of stresses, while the grooves formed by the spiral provide an advantageous guide-way for the lubricant needed by the spindle. The chrome-nickel steel used in these parts is heat treated and ground before being assembled in the yoke of the bearing. The spindles on which the spirals are installed are pinned to the yoke of the bearing, so that the spirals are capable of revolving about their spindles, and the yoke about the shaft, while the yoke and spindles are in a definite, rigid relation. This bearing body is contained in an outer race or planished lining seen in Fig. 2. This is a cylinder split doubly at acute angles to the axis of the cylinder, which is the same as that of the bearing. This split construction results in the correct pressure of the race on the bearing assembly, and bringing about a continuous automatic adjustment of the rela-

tion obtaining between the race and bearing.

An improvement in the outer race is the use of a welded button holding it in position in the housing of the bearing. This button takes the place of the formerly used punched projection. It is made in the form of a very short bolt with a reduced section on one end, which fits into a recess in the lining. It is welded in place, the welding being strong enough to resist any tendency to remove the button from its position.

In places where, besides giving the shaft a frictionless support, the bearing is required to carry a load, as in the case of an axle or differential bearing, the high-duty type of bearing is used.

The high-duty bearing is shown in Fig. 3, it being used in a number of 1912 transmission systems. The rolls are made of 3.5 per cent nickel steel and heat treated to produce the flexibility and strength to hold the speed-change gears in alignment and insure silent performance of the gearset. The yoke used in this bearing is seen in Fig. 4. It is of high-class steel, and the rollers are secured to it as in the standard type of bearing, with the difference, however, that they are made shorter, permitting of greater rotative speed. A round bar is placed parallel with the axis of the bearing between each pair of rollers, the series of bars serving as separators. The roller spirals in this bearing are still closer wound, to fill the requirements of lubrication. The outer race is shown in Fig. 6, and it is casehardened and ground for use. The material used in this type of race is an alloy steel of a composition similar to that of the standard type races.

The bearings here illustrated are made at the Harrison, N. J., plant of the Hyatt Roller Bearing Company, Detroit, Mich.

### Gen. El. Cloth Pinions

The General Electric Company, of Schenectady, N. Y., is now manufacturing cloth pinions for all uses where noiseless operation is a desideratum and where the strength of non-metallic gears fills the requirements of the situation. It is claimed

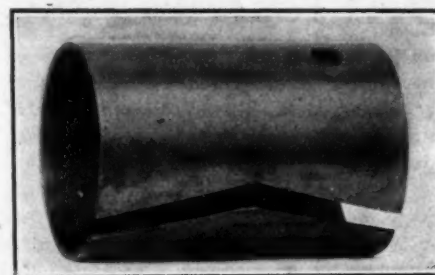


Fig. 2—Hyatt planished outer race

that they equal cast-iron gears in quality, while the material they are made from insures a certain elasticity which is of advantage where a rapidly varying torque has to be dealt with. The pinions are made of blanks consisting of a filler of cotton or similar material compressed at several tons per square inch between steel plates. The whole structure is held together by threaded rivets, or, in the case of very small pinions, by threaded sleeves. After cutting the teeth the cloth is saturated with oil to make it impervious to moisture and inert against changes of atmospheric conditions. Likewise is it immune against the injury vermin may do to some other non-metallic gears. The pinions are cut in all sizes and standard pitches, and while the important types are kept in stock, gears are also made to order by the General Electric Company.

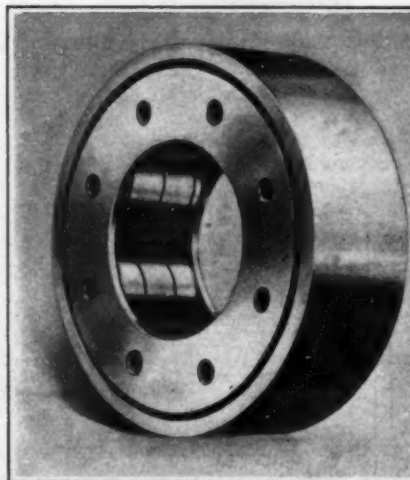


Fig. 3—Hyatt high-duty bearing assembled.

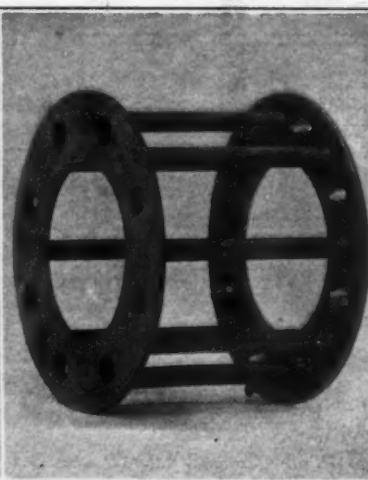


Fig. 4—Yoke of Hyatt high-duty bearing.

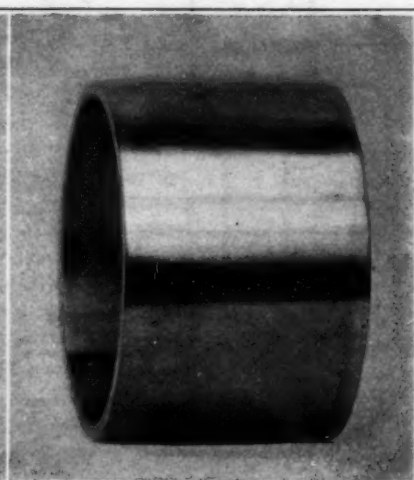


Fig. 5—High-duty bearing outer race